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THE UNIVERSITY OF ALBERTA

An Analysis of Early Postglacial European Prehistory

by

Pamela Rae Willoughby B.A. ©

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FUFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled An Analysis of Early Postglacial European Prehistory submitted by Pamela Rae Willoughby in partial fufilment of the requirements for the degree of Master of Arts.

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Abstract

It is argued that prehistorians concerned with Mesolithic problems have operated in the past under a paradigm which sought to integrate economic and technological/typological criteria. The history of research in this area has followed a standard pattern which, due to its environmental constraints, can be distinguished from all other fields of prehistoric investigation. The history of this concept is examined, and it becomes clear that the Mesolithic forms a prominent front line between so-called 'culture historians' and 'processual archaeologists' (Flannery 1967:119-120). Even so, its meanings are obscure in origin and application. It is recognized that, while this concept has priority for the subcontinent of India, it is not in general use there for obvious reasons. It has immediate relevance for the European early postglacial period, and all definitions imply some sort of readjustment to temperate environmental conditions.

Past models of the Mesolithic relied on a two step division which owes its origins to Hugo Obermaier's Fossil Man in Spain (cf. Obermaier 1924:323). It aligned early Mesolithic traditions with the Blytt/Sernander/Jessen Scandinavian vegetation phases of the Preboreal and the Boreal. These represented Epipalaeolithic industries, showing lithic assemblage continuity with the preceding Upper Palaeolithic. The second phase, assigned to the Atlantic

vegetation phase, was called 'proto-Neolithic', and is mainly marked by marine shell middens, called *kjøkkenmøeddinger*.

It is pointed out that the two phase model does not account for the full range of Mesolithic variability now being revealed, especially in the Danish archaeological record (cf. Brinch-Petersen 1973). Therefore a new hypothesis is presented which defines the Mesolithic as a generalized hunter/gatherer adaptation characteristic of the early postglacial in the Northern Hemisphere. The North American Archaic is seen as a similar but not identical response to environmental factors extant at the time.

If Mesolithic research is to follow the different hypothesis presented here, then it must reinforce the environmental and human ecological parameters within which it operates, possibly as a contributing part of general Quaternary research.

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Chapter I

The General Problem: An Introduction to Archaeological Research Pertaining to the Mesolithic

> Avant que je ne découvre, dans la grotte du Mas d'Azil, les assises à galets coloriés et à escargots et ne fasse connaître leur position stratigraphique entre les dernières couches de l'âge du renne et les prémiers conglomérats à haches en pierre polie, il était admis par plusiers préhistoriens qu'entre l'ère quaternaire et l'ère moderne, il s'était écoulé une longue époque de desolation, pendant laquelle les terres de l'Europe occidentale étaient demurées inhabitées, et la tradition de l'homme avait été interrompue. Ils l'avaient nommée l'*hiatus*. Pour eux, la croyance à l'*hiatus* était preque une dogme; le monde quaternaire et le monde moderne n'avaient rien de commun (Piette 1895a:283).

Prehistorians of the late 19th and early 20th centuries felt that the European continent, or at least Western Europe, was one vast unpopulated land during the early Holocene. Well documented peoples of the late Pleistocene had apparently retreated northwards with the melting of the last continental ice sheets, following the steppe/tundra herbivores with whom their economic lifestyle was intertwined. Then, around 5600 B.C. (cf. Renfrew 1971:70), intrusions of stock raisers and plant cultivators took place from the Near East through southeastern Europe to the limits of the deciduous forests of the continent (Clark 1968:243).

The concept of an hiatus or gap in European prehistory has long been enshrined in the literature and minds of many archaeologists. It is reflected in derogatory statements about early postglacial prehistory which date back beyond the 1890's when Edouard Piette and others were debating its existence.

Even at present the nature of human adaptation (in an ecological sense) at the time is poorly understood. It is therefore with some surprise that one views the great theoretical foundations built on this framework by men like Lewis Binford (1968a) and Kent V. Flannery (Flannery 1969,1972a,1972b).

A number of case studies of archaeological explanation have recently been faulted on the grounds of errors concerning initial assumptions rather than methodology or even conclusions. A classic argument in this vein was presented in the debate concerning Mayan prehistory between Binford (1968b) and J. Sabloff and G.R. Willey (1967). It is apparently quite easy to confound otherwise reasonable arguments by proper examination of the fundamental principles which underlie them. It is argued here that prehistorians in general must come to grips with the nature of the information they use, and this in turn must lead back to rediscovery and reaffirmation of previous accepted (but still unclarified) terminology.

Nowhere is this fundamental requirement more necessary than in research relating to the early postglacial cultures of Europe. These latter have been lumped into the convenient term 'Mesolithic', a typological classification seemingly used mainly to describe negative concpets. It represents a stage of technological development which is non-Pleistocene, non-agricultural, and possibly even non-'civilized' in the full meaning of the word (cf. the review of European views concerning prehistory in Tringham 1974).

This paper seeks to clarify the term Mesolithic in both of its meanings, one as a developmental stage, the other as an economic adaptation peculiar to Holocene areas affected by rapid environmental change as a result of deglaciation. This latter is possibly the key to the Mesolithic adaptation. Robert Braidwood and Charles Reed argued twenty years ago that the term itself should only be applied to the continent of Europe (Braidwood and Reed 1957:20). It is the position taken here that they are correct, but for the wrong reasons.

In order to argue that the term Mesolithic must be adequately defined, it is necessary to trace the history of the concept as a part of archaeological research. In a way, Mesolithic research can be seen as a microcosm of prehistoric investigations over the last one hundred years. It may in fact be the best indicator of the way in which this field has changed. For this reason, a great deal of emphasis has been placed here on the changing attitudes towards early postglacial prehistory.

It is also necessary to examine the term as represented by its various cultural designations. Since one is dealing with a continent with so many geographical and political divisions, it is perhaps only to be expected that each country would have its own system of classification. In fact this situation is often the case, and more frequently so for Holocene remains than for Pleistocene ones.

In other cases, the systems of classification for French Mesolithic sites, including mainly the terms 'Sauveterrian' and 'Tardenoisian', have spread across the continent. Here too is a problem. The nature of major cultural changes over large geographical areas cannot be contained by typologies which solely classify lithic tool assemblages.

The major emphasis in this paper is placed on an hypothesis which attempts to encompass the wide variety of information presented, and possibly to explain it with regards to environmental and ecological criteria. It is not argued that this model explains any individual situation, but it definitely points the way to the nature of information which must be collected in order to examine it.

It must be emphasized that the information presented here is the result solely of an intensive library investigation. Sources consluted are those written in English and French. While it may be stated that the majority of the theoretical information available is published in one of these languages, it is impossible to assess the total range of Mesolithic adaptations without access to additional sources. Therefore, the arguments presented here can only be seen as an attempt to come to grips with the nature of early postglacial prehistory through the filter of the academic literature.

In 1944 V. Gordon Childe examined the nature of archaeological classification and concluded that prehistoric ages had to be seen solely as stages (Childe 1944:7). This was a result of the work of prehistorians who recognized that these so-called 'ages' (such as the Stone Age, Bronze Age), were not contemporaneous everywhere (Childe 1944:7). But Childe felt that stages were ages in the sense that they were periods of time in which each stage did represent the highest technological level attained (Childe 1944:7).

The technological side of evolution was one that was especially important to 19th century evolutionists. Anthropologists of the 20th century reaffirmed it by gathering their theoretical bases from Marxist scholars. Engels' 1884 interpretation of Lewis Henry Morgan's Ancient Society, titled The Origin of the Family, Private Property and the State (Engels 1972), was translated into modern anthropological research by Leslie White, and into prehistoric studies by Childe. It was the materialist emphasis of anthropology at the time which gave impetus to economic interpretations of archaeological information.

At present it is not felt that any one prehistoric stage meant absolute ascendancy over all previous. One must note that the Mesolithic stage itself was never seen as a progressive step. Innovations at the time were limited to the development of woodworking tools as well as fishing gear, and the domestication of the dog (Canis familiaris)(Childe 1944:8). In many ways the Mesolithic was thought of as a retrogressive step, a settling in to local environments as a result of deglaciation. No longer could apparently spectacular societies such as those of the late Würm exist. In their place were geralized Mesolithic hunter/gatherers who followed this lifestyle because it was the only one left to them (cf. Kozlowski 1973:332-3 for a recent restatement of this view).

Information concerning European Mesolithic and other early Holocene cultures is vital at present since this stage holds the key to comprehension of the nature of early agricultural adaptations, a perennial favorite for examination. Somewhere, somehow these self-same 'monotonous' and 'degenerate' societies had to change to full blown Neolithic agriculturalists. But reassuringly for European prehistorians who still saw their area as one closed systemic whole, the impetus for change was found outside in the Near East. Early animal domestication, however, may have occurred just as early in Greece and North Africa, a situation which complicates the problem (cf. Camps 1969; Jacobsen 1969a, 1969b, 1973a, 1973b, 1974; Jacobsen and Van Horn 1974).

Mesolithic research is very important at present since from its beginnings (especially in Scandinavia), it was intimately associated with Quaternary studies, making use of approaches from a number of diverse disciplines, presently felt to be very scientific, therefore very valid. It is quite easy to obtain basic economic and environmental data for early postglacial sites in the north of the continent. The information collected here was more often than not found in the same locations which were used by geologists and palaeobotanists to make their soundings. It is therefore no coincidence that some of the basic theoretical arguments of economic prehistory or 'bioarchaeology' (Clark 1972b:15) come from a man who has spent over forty years in Scandinavianrelated research- Professor Grahame Clark, and from his students.

Not only does the Mesolithic have a clear economic orientation (whatever orientation that may be), it also is tied in with lithic assemblages which contain high frequencies of geometric or other microlith forms. Not all microliths can be called Mesolithic. The Late Pleistocene Upper Palaeolithic site of Pavlov or Dolni Vestonice in Czechoslovakia has a lithic component characterized by microliths (cf. Klima 1962:197). Not only do full glacial sites contain these implements, they are also the most common elements in early Holocene sites outside of any glaciated or periglacial territory. A case in point is India where many Holocene sites representing both hunter/gatherer and agricultural economies contain high percentages of microliths (Gordon 1960:16-26; Joshi 1968; Misra 1965, 1973; Sen and Ghosh 1966; Todd 1950). The individual economic relationships of these sites is not known, but they extend into both the Indian 'Mesolithic' and Neolithic (Misra 1965:57). Similar sites are found throughout North Africa.

Feelings about Mesolithic microliths differ. In 1894 Boyd Dawkins called them the "waifs and strays" of archaeological classification (Dawkins 1894:248-9). A year later W.J. Lewis Abbott described them as "charming little highly specialized forms" (Abbott 1895a:129). Grahame Clark called them "small and monotonous" (Clark 1962:100), no doubt referring to the distribution of similar forms over vast geographical areas. These statements are naturally subjective, but reveal the status of attitudes towards the Mesolithic, both in the past and at present.

Chapter II

The Historical Problem

> By contrast to what had passed away the Mesolithic societies leave an impression of extreme poverty (Childe 1942:39).

The usually straightforward history of prehistoric research becomes murky when one analyzes early Holocene studies. The confusion of Mesolithic research has its basis in the recognition of a multitude of separate sources from which the term itself was possibly derived.

The first clear statement concerning the Mesolithic seems to appear in a table in Hodder Westropp's Prehistoric Phases in 1872 (cf. Table I)(Westropp 1872:xxiv). Here the term applies to a nomadic hunting and fishing phase of cultural evolution, associated with the exploitation of red deer (*Cervus elaphus*), wild boar (*Sus scrofa*), and wild ox (*Bos primigenius*)(Westropp 1872: xxiv, 8). This table was a modification of Westropp's 1866 paper which proposed a Stone Age Sequence of Palaeolithic, Mesolithic and Kainolithic (equalling Neolithic)(Daniel 1967:260).

Westropp distinguished the artifacts of the Mesolithic stage from both the industries of the 'Drift' (or Pleistocene) and those of Neolithic affinities (Westropp 1872:65). The Mesolithic implements were described as,

TABLE I

European Prehistory According to Westropp (1872:xxiv)

Stages of the development of man	Stages of the development of implements	Contemporaneous Animals	Contemporaneous Trees in Denmark	Contemporaneous Burials
Barbarous	Paleolithic: rough flints	Mammoth, Rhinoceros, Tichorinus, Cave bear, Hyena, Reindeer		
Hunting	Mesolithic: flint flakes, flints chipped into shape	Red deer, Wild Boar, Wild Ox	Fir	Tumuli Stone circles Body in a sitting posture
Pastoral	Neolithic: stone implements ground at edge; stone implements all ground and polished	Sheep, Ox, Goat		Cromlechs, Stone circles. Body in a contracted position
Agricultural	Bronze: Arrow-heads, spearheads, swords, flat celts, palstaves, socketed celts	Domesticated Sheep, Ox, Horse, Pig	Oak	Tumuli Cremation
State	Iron: celts, spears, swords, arrowheads	Cereals: wheat, barley	Beech	Tumuli Cremation Inhumation

> ...the flint implements (the flint flakes and the chipped flints) found on the surface in England, Ireland, Denmark, and other countries which belonged to a people who lived by the chase (Westropp 1872:65).

Westropp adopted the comparative method of ethnographic analogy in order to equate Mesolithic societies with those of his own time. Interestingly enough, it is the Danish kitchen middens or kjøkkenmøeddinger to which he draws the comparison;

> The rude inhabitants of Terra del Fuego, who fed principally on shell-fish, probably present analogous features to those who lived on the Danish shores in the earliest period, traces of which they have left in the kitchen-middens or shell heaps; and Darwin describes the inhabitants of Terra del Fuego as living chiefly on shell-fish, and obliged constantly to change their place of residence, but returning at intervals to the same spots, as is evident from the piles of old shells (Westropp 1872:19-20).

Unlike his Danish contemporaries, Westropp accepted that the kjøkkenmøeddinger represented hunter/gatherer remains, and not Neolithic ones.

Westropp's book is a disaster of archaeological equations with ethnographic analogy. How he happened to make use of the term 'Mesolithic' is not known, but the tone of the volume leaves one with the impression that it was a term in general circulation at the time, at least in archaeological circles.

The first mention of geometric microliths was by Burton in 1871, who reported them from near the twon of Bethlehem in the Near East (Coutil 1912:301). But the first archaeological remains assigned to an early postglacial industry were recovered in the Vindya Hills, central province of India, by A.C. Carlleyle of the Archaeological Survey of India (Binford 1968a:314; Wilson 1892:139), who was following the work here by Rivett Carnac in 1871 (Coutil 1912:301).

These first flints became widely travelled. Carlleyle either sent or carried them back to the United Kingdom, where they became the focus of instant speculation in the Royal Anthropological Institute (cf. Brown 1889, 1892/3; Dawkins 1894). From here they were sent to the United States National Museum, and were entered into the records there by Thomas Wilson (Wilson 1892, 1893).

Carlleyle's work is of interest, if only from an historical point of view. In the 1870's and 1880's he was Assistant of the Archaeological Survey, which was under the direction of Major-General Sir Alexander Cunningham C.S.I., C.I.E. (cf. Carlleyle 1878). The Archaeological Survey of India was an arm of the British Raj, apparently given the authority to make an inventory of all the subcontinent's cultural treasures, everything from the Taj Mahal down to a few flint implements.

Carlleyle's 'Mesolithic' research seems not to have been very important to him personally. His work in this area remains inadequately published, and even his recorded sites cannot be located at present (Misra 1965:58). He did, however, recognize the fact that these implements could not be assigned to any one stage in prehistory.

> Mr. Carlyle [sic], while agreeing that these implements belonged to the neolithic period, has found those belonging to the palaeolithic period in the same locality, and believes that the evidence of the archaeology of the district shows, contrary to the opinion held in regard to Western Europe, that there was no such hiatus between the palaeolithic and neolithic periods, and that the series of implements run from one period to the other, their difference being accounted for by the general progress from the lower to the higher civilization. To this period of transition Mr. Carlyle has given the name of 'mezolithic' [sic] (Wilson 1893:456).

In 1865 Sir John Lubbock (later Lord Avebury) suggested in his book Prehistoric Times (Lubbock 1890) that the Three Age system of J.J. Worsaae and C.J. Thomsen should be expanded into a four-age time-specific sequence. He advocated the division of the 'Stone Age' into two forms, and suggested the names Palaeolithic and Neolithic for them (Lubbock 1890:2). These phases paralleled the French recognition of an *âge de pierre taillé* and an *âge de pierre polie.*

The first stage was,

> ...that of the Drift; when man shared the possession of Europe with the Mammoth, the cave bear, the woolly-haired rhinoceros and other extinct animals. This we may call the 'Palaeolithic period' (Lubbock 1890:2).

The other was,

> ...the later or polished stone age; a period characterized by beautiful weapons and instruments made of flint and other kinds of stone; in which, however, we find no trace of the knowledge of any metal, excepting gold, which seems to have been sometimes used for ornaments. This we may call the 'Neolithic period' (Lubbock 1890:2).

The two stages were therefore immediately felt to be time-specific as well as mutually exclusive. Since the Palaeolithic and Neolithic were completely separated with regards to time, industries and environments, it was felt that an hiatus or gap existed in European prehistory. This gap represented early postglacial Europe as uninhabited and perhaps as uninhabitable at the time.

White the British researchers of the time believed strongly in the hiatus concept, some French prehistorians felt that the gap existed only in knowledge and not in fact. Although Gabriel de Mortillet was reported in 1872 as saying that the hiatus did exist,

> Entre le paléolithique et le néolithique, il y a une large et profonde lacune, un grand hiatus; il y a une transformation complète (de Mortillet in Piette 1895b:236),

two years later he privately mentioned to Edouard Piette his reasons for this statement;

> Entre l'époque paléolithique ou des cavernes et l'époque néolithique ou de la pierre polie, il existe un hiatus; mais cet hiatus n'est qu'un simple lacune dans nos connissances. Il ne représente pas une véritable lacune dans le temps et dans l'industrie. Certainement l'époque paléolithique a dû se rattacher et se souder à l'époque néolithique; mais nous n'avons pas encore découvert le point de contact. Entre les deux époques, il n'y a pas eu une période où l'Europe était hospitable; seulement, les restes de l'époque de transition ou de passage, n'ont pas encore été trouvés et reconnus. C'est ce qui constitue l'hiatus que nous constatons. Je le répète, cet hiatus n'est pas réel; il n'existe que dans le résultat de nos études et de nos recherches actuelles. Je devais une explication parce que je suis le principal propagateur de l'idée de l'hiatus. J'ai signalé le fait pour stimuler les recherches et les investigations (de Mortillet in Piette 1895b:237).

But back in London the debate raged. John Allan Brown, attracted to Carlleyle's flints, demonstrated their existence elsewhere in the Old World (Brown 1889), and proceeded to argue rather prematurely that these demonstrated the "continuity of the Palaeolithic abd the Neolithic periods" (Brown 1892/3);

> It is evident, I think, that these peculiar types of implements are of Neolithic age; the commencement of that period and the conclusion of the Palaeolithic shows no definite line of demarcation in India. We shall probably, sooner or later, come to the conclusion that there is really no hiatus between them in Southern Britain: in fact no very good reason has been given why there should be a gap. Recent discoveries show that some of the later Palaeolithic forms closely approach earlier Neolithic types, as shown by many of the specimens found at Cissbury, and in the upper deposits of some of the caves; we only require more evidence of the fauna which continued into early Neolithic times in Southern Britain to complete the bridge as Mr. Carlyle believes is the case in India where, he says, the Palaeolithic and Neolithic periods are connected, as far as the types of the implements go, by certain forms which appear to be intermediate and to which he has applied the term Mesolithic (Brown 1889:138-139).

The implements which Brown postulated as diagnostic of the British Mesolithic were not microliths at all (cf. plates III and IV in Brown 1892/3). No size references were given for them, but none are microlithic, and some are even described as 'long' or 'large' (Brown 1892/3:98). Brown's Mesolithic type list included chipped axes or celts, double edged axes, chipped flat oval implements, large convex and concave scrapers with coarsely worn edges, and spear heads formed of flakes with a worked depression on each side of the butt (for the purpose of hafting) (Brown 1892/3:75).

Brown himself described as Mesolithic,

> ...Implements which from their form, and in many cases from the character of the deposit in which they are found, appear to be of intermediate age between the Palaeolithic and the Neolithic, or polished stone periods. The implements are of flat pear shaped or of more decided axe form-no implement with unworked butts-implements made from flakes struck off nodules taken directly from the chalk (Brown 1892/3:94).

Boyd Dawkins, a geologist, felt that the two phases (palaeolithic and Neolithic) were separated from each other by a revolution in climate, geography and animal life (Dawkins 1894:242). He felt that forms represented in Brown's English data were only Neolithic ones which had either not been completed or were not completely 'evolved' (Dawkins 1894:250). He accepted the common view of the time that the transition from one to the other had to have occurred elsewhere, presumably outside of the continent (Dawkins 1894:257). By this argument, therefore, it was not demonstrated that the 1,674 specimens of Indian microliths from Carlleyle's collection (cf. Wilson 1892:139) had any parallels in Europe, and the problem of the hiatus was not yet solved.

Another approach to Mesolithic research laid emphasis on the environmental tradition in European prehistory. This approach had its beginnings in Northern Europe. The Scandinavian 'connection' was represented by archaeologists and geologists such as Christian J. Thomsen, J.J. Worsaae, Sven Nilsson (1868), Axel Blytt, Rudgers Sernander (1908), and more recently by K. Jessen (1935), J. Iverson, and J. Troels-Smith (1966/7).

Prehistoric research in Scandinavia centred on coastal shell middens as well as on interior bog sites. A committee was struck in the middle of the 19th century with the expressed purpose of studying the Danish shell mounds. Its members included Professors Japetus Steenstrup (zoologist), Forchhammer (geologist), and Worsaae (archaeologist) (Lubbock 1890:229). It was discovered as a result that the shell middens were contemporaneous with a fir and and pine vegetational phase, as well as the appearance of oak, an event possibly already documented from the inland bog sequences (Daniel 1950:87). Little of the 'hiatus' argument reached Scandinavia. It was decided quite early that the kjøkkenmøedinger could be assigned to the Neolithic phase, and perhaps to its beginning phases (Lubbock 1890:247, 251).

In this area shell mounds were used throughout the late 19th and early 20th centuries as clues to changing sea levels and temperatures, as well as serving as records of faunal immigrations (cf. Antevs 1928). Now the human manufactured records were being analyzed by scientists concerned with all ranges of Quaternary studies.

In the interior of Denmark, Worsaae demonstrated the stratigraphic validity of Thomsen's 'Three Age' system of museological classification (Daniel 1971:140-1). Here the 'Stone Age' was associated with a transition from aspen forests to Scotch fir (locally extinct at present); the 'Bronze Age' was equated with an oak (Quercus sp.), alder (Alnus sp.), and birch (Betula sp.) horizon; and the 'Iron Age' was associated with a white beech level (the most commonly occurring modern species)(Daniel 1950:78).

It was at this time that Axel Blytt (in Norway) and Rudgers Sernander (in Sweden) developed a method of analysis of past Holocene 'climates' based on examination of plant macromaterial from local bog corings. In 1875, Blytt and a Scottish geologist James Geikie, demonstrated the existence of past climatic changes (alternating between maritime and continental conditions) through the examination of peat mosses (Sernander 1908:465). Three consecutively deeper levels found by Blytt in Scandinavian sequences were given the names 'Subatlantic', 'Subboreal', and 'Atlantic' (Sernander 1908:467). A lower bed, the 'Boreal' level, was recognized, which Sernander felt represented a forest bed (hence the name) indicating an earlier phase of arid conditions (Sernander 1908:467). He equated this period with the Ancylus Lake phase of the Baltic Sea transgression, a time when the Baltic was a lake as a result of continual postglacial crustal rebound (Flint 1971:612). For Sernander, the Boreal represented dry and warm conditions during which oak (Quercus sp.) immigrated into Scandinavia (Sernander 1908:471).

Sernander argued that Blytt's 'Atlantic' represented a mild, maritime climate (Sernander 1908:471). He postulated that this was the period of the Magle mosse occupations in Denmark (meaning 'big bog', hence Maglemose [Clark 1972b:3]) as well as that of the kjøkkenmøeddinger and the passage graves (Sernander 1908:471). New immigrants at the time were felt to be Picea excelsa and Fagus silvatica which joined a flora dominated by Quercus pedunculata and Tilia parvifolia (Sernander 1908:471).

Jessen reaffirmed the Blytt/Sernander sequence by giving their phases Roman numeral designations (cf. Jessen 1935). By this time an additional Holocene category had been worked out, the 'Preboreal' (Jessen's Zone IV), marked by a birch (Betula sp.) maximum, an increase in fir (Abies sp.) and the presence of hazel (Corylus sp.) (Jessen 1935:187).

Jessen was able to refine the system as a result of the development of the pollen statistical method introduced by one of Sernander's students. Lennart von Post presented the first modern percentage pollen analyses in a lecture to the Scandinavian scientists' meeting at Kristiana (now Oslo) in 1916 (Faegri and Iverson 1975:14). He developed the method in order to resolve the arguments between Blytt and Sernander (Faegri and Iverson 1975:14) and it was seen as demonstrating the validity of their conclusions.

Knut Faegri and Johannes Iverson have repeatedly postulated that the Blytt/Sernander periods were never lithostratigraphic (as geologically stage-specific), and that whatever biostratigraphic meaning they may have once possessed was lost long ago (Faegri and Iverson 1975:202). Jessen's system, on the contrary, was clearly meant to be biostratigraphic (Faegri and Iverson 1975:202).

He saw his types as clearly divided, and felt that archaeological remains could be dated by assignment to these stages (Jessen 1935:185). To him the Boreal was a period of a fir/hazel maximum with two sequential parts; the first (Zone V) was represented by a fir maximum, the second (Zone VI) by a hazel phase (Jessen 1935:187). Jessen felt that the boundary between his Zone VI and the Atlantic (Zone VII) was conditional on the intersection of the increasing values for the oak mized forest (the Quercetum mixtum of oak, lime and linden) with the decreasing fir curve (Jessen 1935:187).

The work of prehistorians in Scandinavia was deeply conditioned by that of geologists and palaeobotanists. The latter, through the Blytt/Sernander/Jessen method, provided a means of relative dating essential for the proper development of cultural sequences. By the time two influential books on Scnadinavian prehistory appeared (Clark's The Mesolithic Settlements of Northern Europe in 1936 and H. Shetelig and H. Falk's Scandinavian Archaeology in 1937), it was accepted that relics of Mesolithic man in Northern Europe could be assigned to one of the Preboreal, Boreal or Atlantic phases (cf. Clark 1936; Shetelig and Falk 1937). This is not to say that the comparative method and ethnographic analogy fell out of use here. The research of the zoologist Sven Nilsson (1868) demonstrates that the opposite was in fact the case.

Similar developments occurred elsewhere at the same time. In 1887, the French prehistorian Edouard Piette began work at the cave of Mas d'Azil (Ariège) in the French Pyrenees, forty miles southwest of Toulouse (Daniel 1950:126). Since 1870 he had been exploring cave sites and megalithic tumuli in the area (Cartailhac 1891:143), but he decided to concentrate on this one site. Here for the first time was discovered stratigraphic proof of a cultural unit encompassing the so-called hiatus, a complete sequence from the Magdalenian through the Neolithic (cf. Piette 1895a:276-282).

At Mas d'Azil, two possible 'Mesolithic' levels were found, marked by the presence of a temperate fauna and by the absence of any polished stone implements. Level F, to which Piette gave the name 'Azilian', was composed of cinders, charcoal, and bone remains of red deer (Cervus elaphus), chamois (Rupicapra rupicapra), aurochs (Bos primigenius), horse (Equus sp.), 'common bear' (Ursus arctos?), boar (Sus scrofa), badger (Meles meles), 'wild cat' (Felis sylvestris?), beaver (Castor fiber), various birds, fish (including trout, pike, and cyprine fish), and frogs (Piette 1895a:279). Flint implements recovered were of Magdalenian type, similar to those found in reindeer-laden level D at the same site (Piette 1895a:179). Bone implements were also found; perforated harpoons of Cervus elaphus horn. These are felt to represent the fossiles directeurs of the Azilian industry (cf. de Sonneville-Bordes 1960:23-4).

The Azilian was defined by Piette in his first descriptive article about Mas d'Azil.

> Si l'on tient à donner à ses divisions des noms de localités pour les harmoniser avec la terminologie de M. de Mortillet, il est impossible, dans l'état actuel de la science, de ne pas faire une coupure dans ce qu'il à appelé l'époque magdalénienne. J'en ai déjà separé les assises à harpons plats,ovalaires, perforés, en bois de cerf, que l'on confondait autrefois avec le magdalénien, et j'ai réuni sous le nom d'asilien [sic] (Mas d'Azil) les couches à galets coloriés et à escargots (Piette 1895a:282).

The tool assemblage has been defined by Denise de Sonneville-Bordes;

> L'Azilien, qui se relie au Magdalénien final, a un outillage lithique appauvri de facture médiocre, de dimensions diminuées, essentiellement composé de pointes à dos courbes en lames de canif, les pointes aziliennes, de grattoirs courts, de lamelles à dos, ou les burins disparaissent. L'outillage en bois de cerf est limité à des baguettes, des poinçons et des harpons plats à barbelures, avec ou sans perforation en boutonnière. Des galets gravés de dessins géometriques ou peints en noir ou rouge de points et de barres groupés sont les seuls manifestations artistiques; ila abondaient dans le site éponyme du Mas d'Azil (Ariège)(de Sonneville-Bordes 1975:107).

The Azilian of Mas d'Azil is characterized by painted river pebbles, which were felt to be are poor replacement for Magdalenian petroglyphs and pictographs;

> Des barbouillages de convention, en peinture rouge, ce que nous devons nous attendre à trouver à une telle époque de decadence artistique (Cook 1903:660)?

Above the Azilian levels are beds of Helix nemoralis shells as well as the remains of horse (Equus sp.), aurochs (Bos primigenius), red deer (Cervus elaphus), and boar (Sus scrofa)

(Piette 1895a:280). The lithic assemblage is similar to the Azilian, and Piette gave this level the name Arisian, after the Arise River which flows by the site. Surprsingly enough, Piette drew a parallel between this level and the Danish kjøkkenmøeddinger (Piette 1895a: 250), and felt that both were assignable to an era of humid conditions immediately after the Age du Renne (Cartailhac 1896:311; cf. Laplace 1953 for an alternative view).

The work at Mas d'Azil convinced Emile Cartailhac that the hiatus, far from being a cultural abyss (abîme)(Piette 1895b:236), was in fact non-existant and as a result he became a strong proponent of the Azilian (Cartailhac 1891:148; 1896:314). Piette's work had moderate impact in French archaeological circles (Cartailhac was the only notable convert), but minimal effect abroad. In other parts of France and in Belgium, other prehistorians were independently arguing the existence of two new industries, the Sauveterrian and the Tardenoisian, both of which were assignable to early postglacial times.

Edmond Vielle, a juge de paix, recognized geometric microliths from Fère-en-Tardenois as prehistoric tools (Vielle 1890) and effectively began the study of the Tardenoisian. In Belgium trapeze forms of the Tardenoisian are associated with small cores, small blades, discoidal endscrapers and small elongated pointed flakes, all of more or less geometric form (de Loë 1906:423). Le Capitaine Octobron recognized that in many cases all geometric microliths found anywhere could be labelled as Tardenoisian (Octobron 1922b:

230). Tardenoisian industries are now thought to be those with a preponderance of trapezes in the microlith assemblages (Cauvin 1971:33). But Escalon de Fonton and H. de Lumley prefer the term tardenoïdes, reserving 'tardenoisian' for the classic sites of the Paris basin (cf. Cauvin 1971:33), a view held also by Rozoy (1971: 345-8, 1973:504).

Octobron proposed to call Mesolithic all industries of the Final Palaeolithic or early post-Palaeolithic, as well as Tardenoisian assemblages and microlith assemblages with Tardenoisian 'survivals' (Octobron 1925:60; Octobron in Coulonges 1935:44). This grouping was in addition to Piette's Azilian since it lacked reindeer (Rangifer tarandus) remains and since microlith elements were present (Octobron 1925:61).

The Sauveterrian was first defined by Laurent Coulonges at the Abri du Martinet (Sauveterre-la-Lémance)(Coulonges 1928, 1935, 1954). It was associated there with remains of red deer (Cervus elaphus), beaver (Castor fiber), 'wild cat'(Felis sylvestris?), aurochs (Bos primigenius), boar (Sus scrofa), and Helix nemoralis shells (Coulonges 1928:500). At Le Roc Allan the Sauveterrian was identified as interstratified between Azilian and Tardenoisian levels, giving some clue as to its relative age (Coulonges 1935:37-39).

The Sauveterrian is now accepted as an industry with a preponderance of triangular microliths, and no trapezes (Cauvin 1971:19). The status of its division from the Tardenoisian is on the basis of triangles rather than trapezes, although triangles are common in both. In addition to this element, 'Sauveterrian points' (d'étroites lamelles oû les deux bordes abattus peuvent définir une ou deux pointes [Cauvin 1971:19]), are apparently common elements in Tardenoisian assemblages (for instance, those of couche 3 of Roufinnac)(Cauvin 1971:57).

Despite basic problems of classification, by 1924 the French had accepted the concept of a phase de transition (cf. Déchelette 1924:43), what might be labelled a Mesolithic stage.

In 1936 Grahame Clark published a monograph titled The Mesolithic Settlements of Northern Europe (Clark 1936). While travelling in Scandinavia to research this work he came across the wealth of palaeoenvironmental data which had been accumulating for over fifty years. Not only did vast amounts of information regarding Quaternary research exist, but the best (if not only) Mesolithic research had been carried out here. Preservation in these sites was phenomenal. For the first time extensive organic materials such as plant remains were available ofr analysis. In this way hypotheses concerning subsistence, economics and seasonality could be formulated for the first time. Faunal analysis was no longer the sole source of subsistence information.

Clark chose a Mesolithic site in Britain in order to expand his research focus. The site, Star Carr, had been reported before (Moore 1950), and showed promise of preservation similar to Danish interior 'Maglemosean' sites. The participation of palaeobotanists such as Harry Godwin, already interested in the phenomenon of vegetational change and human prehistory (cf. Godwin 1946), was assured by the establishment of the Cambridge University Sub-department of Quaternary Research (Clark 1972b:6, 1974:37).

Clark felt at the time that the Mesolithic was the result of human response to environmental change brought about by the end of the Pleistocene and the onset of the Holocene (Clark 1936:xiv). As a comparison, Carl Sauer, the noted American geographer, also saw the Mesolithic as essentially a postglacial adaptation, but felt its origins lay in the Near East (Sauer 1963:247, 261). According to this view the Mesolithic settlements of Northern Europe were remnants of a prevously widespread Mesolithic horizon, once found throughout the Old World (Sauer 1963:260-1, 1969:23).

Grahame Clark was concerned with the wider European focus of research. He was one of the first to attempt to rationalize early Holocene prehistory in Britain in the light of French and Scandinavian sequences alike (cf. Clark 1936, 1955, 1958). His articles and books have a conistent theme, the need for a wide-ranging biogeographical approach to the understanding of prehistory. He still feels that the environmental change from steppe/tundra conditions to closed temperate forest ones gave the impetus to economic change (cf. Clark 1962, 1968, 1975), and thus would probably limit the term Mesolithic to areas where this impact was felt most greatly.

Although Clark's theoretical position has matured over the years, the basic data he utilizes have not. No adequate synthesis of Mesolithic research has appeared since his 1936 monograph (Price 1973:456), possibly because it was not needed. The status of Mesolithic research, mainly in archaeology, has not changed in seventy years. The focus of palaeoenvironmental research has been altered as a result of Johannes Iverson's concentration on biological rather than climatic explanations for observed vegetational changes. But basic sequencing has not changed to any great extent. Compare Sernander's (1908) synthesis of Holocene palaeoenvironmental change with Flint's (1971:611-2) analysis of Scandinavian geological changes, and one realizes that differences between the two are minimal. But Clark himself was far ahead of his contemporaries in his insistence on an 'economic approach' to prehistory (Clark 1952, 1972a).

Miles Burkitt on the other hand, while recognizing the existence of early postglacial societies, conditioned his acceptance of them.

> At the same time it should be remembered that the problem of the transition time between the old Palaeolithic culture and the Neolithic civilization has never been completely cleared up. However much we bridge the gap there remains something catastrophic in the change. A quiet steady development from Magdalenian to Azilian and from Azilian to Neolithic does not seem probable (Burkitt 1925:190).

Paralleling the work of Clark was that of V. Gordon Childe. While more interested in later phases of prehistory, Childe was also drawn to the Mesolithic as a result of the overwhelming economic information available. He felt that the Northern European Mesolithic societies were peculiarly forest adapted ones, this adaptation being marked by the presence of woodworking tools (for example, in the Maglemosean)(Childe 1931:326, 1937: 234-5). This feature, he felt, was symptomatic of the Northern European plain in Holocene times (Childe 1931:335, ;937:233), the same area which had seen a widespread Upper Palaeolithic tradition in the full glacial (Childe 1957:14; Schild 1976).

By 1912, well before Clark and Childe began writing, there were already frantic calls for a synthesis of early postglacial prehistory. L. Coutil recognized the need for some common terminology in its nomenclature;

> En terminant cet exposé, nous tenons à protester contre la tendance actuelle qui tend à créer des subdivisions à l'infini, ou des appellations nouvelles, qui ne sont pas suffisamment justifiés; on ne fait qu'embrouiller, au lieu de mettre un peu de lumière dans les chronologies des temps préhistoriques: il nous suffit de nous rappeler les diverses appellations déjà données pour distinguer les gisements qui renferment les silex à formes géometriques. Tardenoisien, Captien [sic] (supérieur, inférieur), Gétulien, Ibéro-Maurusien, Intergétulo-néolithique, Loubirien, Tellien, Génèyénien, Silex à contours géometriques, Silex pygmées et micro-silex géometriques, soit douze appellations differentes (en attendant les autres), et cela pour designer toujours la même chose (Coutil 1912:309).

The names mentioned by Coutil were only the French designations. If he had branched out beyond the French literature he would have identified many more.

In the late 1920's R.A.S. Macalister (1921) and G.G. MacCurdy (1924, 1929) both attempted to straighten out Old World Prehistory as it was understood at the time, and both made use of the term Mesolithic (Macalister 1921:516; MacCurdy 1929:14). Macalister is credited with the first clear definition of the Mesolithic (Daniel 1950:233), but it is difficult to see from where this designation arises. He did use the term, but only to describe individual facies of it such as the Azilian (Macalister 1921:524-5). There was no attempt at a basic synthesis, even along the limited lines tried by Coutil in France (Coutil 1912).

There was a minor argument in the British journal Nature in the early 1930's concerning the Mesolithic. J. Reid Moir, an archaeologist who had already published a monograph on one facet of British prehistory, The Antiquity of Man in East Anglia (Moir 1927), attempted to defy all laws of classificatory convention by trying to eliminate one more seemingly superfluous term.

> Archaeologists, of whom I am one, are really quite remarkable people. It is notorious that the nomenclature of their study is already in a sad condition, yet, recently, they have gone out of their way to make confusion more confounded. It has now become the practice to describe early neolithic flint implements by the term 'mesolithic', a term which means, of course, 'Middle Stone Age'. Some misguided individual, however, evidently possessing, in full measure, the common archaeological flair for promoting the use of a misleading terminology, has applied it to relics referable solely to the end of the Stone Age, and to make matters worse, the practice is becoming widespread. I find it necessary to remind myself that I am writing to the editor of a highly reputable scientific journal, and this knowledge, I confess, somewhat cramps my style. I would like to say many other things about the term 'mesolithic'. But if

> archaeologists wish to retain a vestige of a reputation for reason, let them drop this word now, and for evermore (Moir 1933:106).

As pointed out by H.J.E. Peake (1933:105) and Raymond Vaufrey (1934:220), the word Mesolithic is perfectly valid, and in addition has priority;

> ...le mot 'mésolithique' a sa valeur propre, parfaitment conforme à son étymologie. Le Mésolithique, c'est quelque chose de bien défini stratigraphiquement, paléontologiquement, et archéologiquement comme intérmédiaire entre le Paléolithique et le Néolithique (Vaufrey 1934:220).

Beginning in the late 1950's, arguments regarding the Mesolithic have switched to statistical fronts. Using methods pioneered by François Bordes and Denise de Sonneville-Bordes (cf. De Sonneville-Bordes and Perrot 1953), Jacques Tixier, Georges Laplace and others have attempted to reduce Mesolithic assemblages to a list of common types (Laplace 1954, 1958, 1966; Pradel 1954; Tixier 1963; Rozoy 1967a, 1967b, 1968a, 1968b; Groupe d'etude de l'Epipaléolithique-Mésolithique 1969). Each type is given a value based on its percentage of the total assemblage, and cumulative graphs are drawn which purport to illustrate the similarities or differences between assemblages. It is difficult, therefore, to compare Mesolithic graphs with Upper Palaeolithic ones since the lists of types differ significantly. Although the type lists themselves have much in common (from one-third to one-half of the diagnostic types), the numbering system used differs (cf. Laplace

1954; de Sonneville-Bordes and Poerrot 1953:325). This feature is not a major problem with the Laplace system; his attribute lists can be used for both since they were developed to examine and compare lithic assemblages, not time-specific industries (cf. Laplace 1958, 1966). Laplace also places his results in bar graphs comprising the percentage of each major class for each assemblage, a system which reflects absolute differences, not the relative ones of the cumulative graph (Laplace 1966:36-9).

North American influence in Mesolithic research has mostly been in the human ecological field. This work began with the Iraqi Jarmo project directed by R.J. Braidwood (Braidwood 1952, 1960; Braidwood and Howe 1960; Braidwood and Reed 1957). This research was the first examination in the Middel East of the nature of the role of the environment in the development of agriculture as a means of production. It was also one of the first investigations of the nature of Mesolithic hunter/gatherers in their own right.

Braidwood and Reed pointed out that the Mesolithic as a concept probably had validity solely for Europe;

> The word 'mesolithic' does have considerable focus in meaning is its usage is restricted to those archaeological materials of northwestern Europe which indicate various cultural readaptations to the early post-glacial succession of environments in that area...But whether such 'mesolithic-ness' exists as a world-wide phenomenon, and whether it is different in kind from 'upper palaeolithic-ness' are quite different matters. We suspect that from a purely subsistence level point of view, there is no difference in kind between the two (Braidwood and Reed 1957:20).

They also pointed out the similarities between the Mesolithic and the North American Archaic. The latter was seen as a generalized foraging pattern of human adaptation in the early postglacial of Eastern North America (Braidwood and Reed 1957:20; Jennings 1968:110-111; Willey and Phillips 1958:104,107). This pattern was purported to represent,

> ...an ecologically well adjusted subsistence level which seems to have been resistant to possibly early incursions of less efficient vegeculture or to incipient agriculture (Braidwood and Reed 1957:21).

The idea of the Mesolithic as a parallel development of the Archaic was discussed by Albert Spaulding (1942). He argued that each was a similar ecological adaptation to the boreal forest zone of the Northern Hemisphere (Spaulding 1942:143). This idea was expanded by Caldwell (1962:228) into the definition of the Archaic as a,

> ...trend to the establishment of primary forest efficiency-represented by changes in hunting methods, emergence of economic cycles and food specializations and achieving a kind of balanced reliance on almost all sources of natural foods.

This efficiency would have effectively negated the 'beneficial' aspects of plany cultivation, and would therefore have selectively eliminated it as a cultural choice.

Research concerned with the transition from food collection to food production in both the Old and New Worlds has demonstrated the slowness of that change (Smith 1972:4). It was the work of MacNeish in the Tehuacán valley of Mexico (cf. MacNeish 1972, 1974, for the most recent statements) that gave impetus to this model of gradual transition from one mode of subsistence to another. This model, best articulated by Kent Flannery (Flannery 1966, 1968), led to the hypothesis of human utilization of 'microenvironments', or,

> ...smaller subdivisions of large ecological zones; examples are the immediate surroundings of the ancient archaeological site itself, the bank of a nearby stream, or a distant patch of forest (Coe and Flannery 1964:650-1).

This model of exploitation of diverse, yet geographically close environmental areas is now almost an axiom of prehistorians;

> ...the most viable policy for human communities, the one that gave them the best chance of surviving local or temporary shortages or failures, was to exploit not one but two or three distinct ecological zones (Clark 1975:11).

North American trained prehistorians have argued that the European (and especially the Near Eastern) Mesolithic represents a broad spectrum adaptation of multiple use of microenvironments;

> The trend is rather from exploiting a more 'narrow spectrum' of environmental resources to a more 'broad spectrum' of edible wild products. This 'broad spectrum' collecting pattern characterized all subsequent cultures up to about 6000 B.C., and I would argue that it is only in such a context that the first domestication could take place. It is a pattern in which everything from land snails (Helix sp.) to very small crabs (Potamon sp.) and perhaps even cereal grasses was viewed as potential food (Flannery 1969:77).

Flannery's broad spectrum adaptation is seen as characteristic of the Mesolithic of the Near East (cf. Binford 1968a;

Flannery 1969, 1972a). He feels that the first steps to sedentism may have taken place at this time (Flannery 1972b:23), and that leisure time to experiment with cultigens and the technology associated wth them was provided by the reliance on alternative subsistence strategies (Flannery 1969:77). This is a similar model to that presented for La Victoria on the Pacific Coast of Guatemala, a site which, although it did not see the first domestication of maize (Zea mays), nevertheless was apparently the site of one of the first settled villages on the continent (cf. Coe and Flannery 1967).

The research carried out by Flannery was stimulated by that of Lewis Binford (1968a). Binford argued that early postglacial changes in the Near Eastern prehistoric record were the result of marked environmental (and therefore exploitative) shifts; for example, those resulting from worldwide sea level changes (Binford 1968a:317-8, 334). These changes, according to him, resulted in population disequilibriums which in turn led to increasing exploitation of seasonal maritime resources (anadromous fish, migratory fowl), a development seen as occurring at the end of the Pleistocene (Binford 1968a:334).

Binford's model is not entirely satisfactory (cf. Hassan 1973, among other critiques), but Flannery's is partially born out by the evidence. Its usefulness for 'explaining' the emergence of food production, however, is rapidly diminishing (cf. Higgs and Jarman 1972). But despite this, the literature produced as a result of the Binford-Flannery hypothesis is some of the best in terms of both method and theory.

The Mesolithic then has in a way become the front line between so-called 'processual archaeologists' and 'culture historians' (cf. Flannery 1967:119-120) in both hemispheres. The main difference between these two schools of thought rests in their orientation. The culture historians have concentrated on the delineation of basic time/space chronologies and stages, and have documented the nuances of cultural change throughout the world. The processualists have taken off from this information in an attempt to discover the mechanisms behind observed change. In a way this represented the natural evolution of a discipline (cf. Chamberlin 1964; Kuhn 1970). Palaeoecological research has also altered its perspectives, following the lead of ecological studies, from concern with closed to open systems. Research can profit, and has done so, from this debate.

The most recent summary of postglacial prehistoric research is the result of a symposium centreing on the Mesolithic of Europe (Kozlowski 1973b). In the publication of ths meeting is a series of papers representing the contributions of both schools of thought. The focus of attention in the book is individually one of environmental/economic problems or alternatively, on lithic typology and cultural diversity. This is the bimodal distribution of Mesolithic research in the last one hundred years repeating itself in sequence. There is no overall treatment of the state of Mesolithic research; the one attempt at it (Kozlowski 1973a) fails miserably. Postglacial prehistory in Europe is little advanced in terms of classification over 1912 when Coutil was deriding the embarassment of riches regarding terminology. In addition, Mesolithic research also has apparently decreased statistically in popularity in the last decade (cf. Zubrow 1971: 198), this situation despite the Binford-Flannery model. It is difficult to predict where this research will go in the future. It is a premise of this paper that those concerned with Mesolithic problems must work within the framework of models or hypotheses which take into account the diversity of early postglacial cultural manifestations. Such an hypothesis will be presented in chapter five.

Chapter III

The Environmental Directive to Mesolithic Research

> These works show that combinations between the floristic and cultural developments throughout the postglacial era have been made under various forms, resulting in valuable contributions to the dating of the vegetation forms (Jessen 1935:186).

By the 20th century, the various disciplines of palaeoenvironmental and archaeological research formed a network of inter-dependence, at least in northwestern Europe. Its focus was on the delineation of both human and natural-historical developments during the postglacial. It was quite natural that these became linked, especially in Denmanrk where most investigations in the main concentrated on the same sites, peat bogs. It was commonly felt that only here were records available which could serve to clarify and roughly date the major events of the Holocene.

Almost all Mesolithic reports from this century begin with an environmental chronology which serves as an attempt to concentrate on climatic, vegetational, and overall ecological change. This chronology formed the framework within which the classic Mesolithic concept was first worked out, that of a forest-centred generalized hunter/gatherer adaptation (cf. Childe 1931, 1937).

Axel Blytt and Rudgers Sernander began the macrofloral examination of bog deposition; Lennart von Post extended this research to microscopic analysis of pollen stratigraphy. However, all systems subsequently produced mimicked those of the early palaeobotanists. Such a system is presented in a diagram showing the pollen stratigraphical sequence for the last 14,000 years (cf. Table II).

By recent convention, the postglacial or Holocene begins with the end of the Older Dryas (Jessen's Zone Ic) and the onset of Allerød conditions. But the first stage of the postglacial archaeological record is the Preboreal, diagnostically represented by a birch (especially _Betula_ _pubescens_), pine (especially _Pinus sylvestris_) and aspen (_Populus_ sp.) forest. This phase was supposedly followed by a cool, dry Boreal (marked by a rise in hazel or _Corylus_ values), then a moist warm Atlantic, marked by the presence of thermophilous species such as lime (_Tilia_ sp.), elm (_Ulmus_ sp.) and oak (_Quercus_ sp.)(Jessen 1935:187).

The correlations on the chart constructed by Flint (cf. Table II) are identical to those first established by the Scnadinavian palaeobotanists. The network of relationships presented here has had a profound impact, and has been accepted as the framework on which to construct more detailed models of past vegetational history in widely different biogeographical areas. But the Blytt/Sernander system itself was established initially for a restricted area, not for whole continents.

In a similar way, Mesolithic research in turn has been influenced deeply by palaeoenvironmental reconstructions. It was

TABLE II Pollen-Stratigraphic Sequence In Northern

<table>
<tr><th rowspan="2">C14 Years B.P.</th><th colspan="2">Glacial Events</th><th rowspan="2">Baltic Water Bodies</th><th rowspan="2">Central France (Highlands)</th><th rowspan="2">Southwest Germany</th><th rowspan="2">England</th><th rowspan="2">Netherlands</th></tr>
<tr><th>Continental Europe</th><th>Britain</th></tr>
<tr><td>1000</td><td rowspan="9">Ra and Central Swedish Moraines Salpaeus-selkä I,II</td><td rowspan="9">Loch Lomond Readvance</td><td rowspan="3"></td><td>fields, pastures, forests of oak beech</td><td>fields, pastures, forest of beech with spruce, oak</td><td rowspan="2">fields, pastures, oak forest</td><td rowspan="2">fields, pastures, heaths
forest of beech, oak</td></tr>
<tr><td>2000</td><td>beech-fir with oak, alder</td><td rowspan="3">beech forest
Clearances</td></tr>
<tr><td>3000
4000</td><td rowspan="2">beech-fir forest with oak, lime, ash</td><td rowspan="2">woodland of oak with lime, ash, beech hazel
Clearances
Elm decline</td><td rowspan="2">woodland of oak, with lime, beech ash, hazel
Clearances</td></tr>
<tr><td>5000</td><td rowspan="2">Littorina Sea</td></tr>
<tr><td>6000
7000</td><td>linden oak forest with elm</td><td>lime with elm, ash, oak</td><td>oak with lime, alder etc.</td><td rowspan="2">lime with elm, ash</td></tr>
<tr><td></td><td rowspan="2">Ancylus Lake
Echineis Sea</td><td rowspan="2">hazel-oak forest with elm</td><td>lime, hazel with elm</td><td rowspan="2">hazel with pine, elm, oak
with hazel</td></tr>
<tr><td>8000
9000</td><td>hazel with elm, lime etc.</td><td>pine hazel forest</td></tr>
<tr><td>10000</td><td>Yoldia Sea</td><td>birch-pine forest with oak</td><td rowspan="3">pine forest</td><td>birch forest
Juniper</td><td>birch-pine forest</td></tr>
<tr><td>11000</td><td rowspan="3">Baltic Ice Lake
?</td><td rowspan="2">open forest of birch, pine</td><td>tundra</td><td>park tundra</td></tr>
<tr><td></td><td rowspan="5">East Jylland (Pomeranian?) Readvance</td><td rowspan="2">Perth re-advance</td><td>open birch forest</td><td>pine forest birch forest</td></tr>
<tr><td>12000</td><td rowspan="4">pioneer vegetation of juniper Artemisia, etc.</td><td rowspan="2">open birch forest, Juniper, Hippophai</td><td rowspan="4">tundra</td><td>tundra</td></tr>
<tr><td></td><td rowspan="3">Lammermuir Readvance</td><td rowspan="3">Ice lakes in central Skane</td><td>birch park tundra</td></tr>
<tr><td>13000</td><td rowspan="2">pioneer vegetation of Artemisia, etc.</td><td>tundra</td></tr>
<tr><td>14000</td><td>polar desert</td></tr>
</table>

Europe Through the Last 14000 Years (Flint 1971:632-3)

		Blytt-Sernander and other names	Pollen Zones	Western Denmark	Southern Sweden (including Scania)	Central Poland	Southern Finland
Postglacial of Pollen Stratigraphers		Subatlantic	IX	fields, pastures, heaths, beech forest transition	same, forest of spruce or beech with pine, oak spruce, beech, pine, oak Clearances	fields, pastures, forest of pine, spruce hornbeam	pine-spruce forest
	Hypsithermal	Subboreal	VIII	browsed forests of lime ash, oak Clearances	oak with pine, lime, ash Clearances	pine, hornbeam oak, lime Clearances	birch-pine forest with lime, elm, hazel
				Elm decline			
		Atlantic	VII VI	lime with elm, oak (Climax forest) transition	lime with elm, oak, pine	lime, pine with elm, oak	birch-pine forest with hazel, elm
		Boreal	V	Hazel-pine	pine-hazel	pine forest with hazel, elm	pine forest with birch
		Preboreal	IV	(+ pine) birch forest Juniper stage	(+ pine) birch forest	pine forest	birch forest park tundra
Late Glacial		Younger Dryas	III	park tundra	tundra	pine park tundra	tundra
		Allerød	II	open birch forest	birch park tundra	pine forest birch forest	Ice
		Older Dryas	I c	tundra	tundra	birch park tundra	
		Bølling	I b	birch park tundra	Ice	Tundra	
		Oldest Dryas	I a	tundra			
Full Glacial				polar desert			

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generally accepted that if these vegetational stages represented important biogeographical changes over time, then people who lived in close proximity to the environment, such as hunter/gatherers, would alter their adaptive strategies in response. This attitude has best been expressed for the Mesoltihic by H.T. Waterbolk who has argued that the onset of Atlantic (Jessen's stage VI) conditions effectively revolutionized the entire Mesolithic adaptation;

> ...the Atlantic forest as such was an unfavorable environment for man, and European man could best survive by adapting himself to the coast (Waterbolk 1968:1096).

This statement implies the model and/or paradigm (cf. Kuhn 1970:10) under which most Mesolithic research has been carried out; that the stage can be effectively divided into two subsets, one belonging to the Preboreal/Boreal (the Maglemosean), the other to the Atlantic (the kjøkkenmøeddinger). This contrast of Epipalaeolithic and 'proto-Neolithic' adaptations has a long history of acceptance in this field (cf. Obermaier 1924:323; Gabel 1858a:659). Such an assumption effectively negates any investigation of the variety of apparently contemporaneous adaptations, such as the nature of the Kongemose/Maglemosean relationships, as well as the Kongemose/Ertebølle ones.

The interpretation of human adaptation to a changing environment retains a thread of continuity throughout Mesolithic research. In another context, these attitudes imply a deterministic view of human adaptation, one in which man as a collective whole is required to submit to the whims of the environment since his cultural trappings cannot possibly serve to alter his 'natural behavioural' responses. Such a viewpoint is proposed by Ezra Zubrow for the prehistoric American Southwest in a study which accounts for everything but the chance of peculiarly human action in the form of conscious selection concerning adaptation (cf. Zubrow 1972b, 1975). An alternative view is presented by Grahame Clark, who emphasizes cognitive choice as a major factor to be considered when examining the archaeological record;

> ...bioarchaeology is not, in the final analysis, biological; it is archaeological because it is concerned with communities whose behavioural patterns were conditioned and mediated by and through culture-communities, moreover, whose members subscribed to socially transmitted and consciously held values. From this it follows that models appropriate to biology are insufficiently sophisticated to cope without qualification with all the complexities of human society...Yet if human behaviour, even the behaviour of people at the rather elementary level of technology with which we are here concerned, is to some degree specific to the particular historic communities in which men live, if the diversity of human societies at the same level of technology is the product of choices that may even run counter to the immediate logic of economics, it remains true that the behaviour of humans as of other animal groups is subject to environmental constraints and takes advantage of environmental potentialities. These constraints and franchises are capable of definition and in many cases, when quantified, are capable of defining regularities in archaeological phenomena that might otherwise remain undetected. Analysis of the manner in which the communities documented by archaeology appropriated and utilized the resources available to them, although it cannot explain the choices made, at least helps to define the options (Clark 1972b:15).

Clark recognized that the Mesolithic as a whole was not stage-specific to any one part of the Blytt/Sernander system. According to him, it encompassed at least three markedly different sets of conditions (Clark 1936:53; reproduced as Table III). In a way then, the most effective means to understand this particular early Holocene 'stage' may be as a series of adaptations to rapidly changing environmental conditions.

W.M. Wendland and Reid A. Bryson present a model of Holocene climatic change based on a series of steps; one of "stable climatic episodes separated from each other by shorter and 'abrupt' transitions" (Wendland and Bryson 1974:10). They postulate that environmental factors which normally would be affected by climatic change can be seen as 'proxies' for that change, and should in fact record it in some way (Wendland and Bryson 1974:10). It is interesting to note that the most profound discontinuities that they identify for what might be called Mesolithic times have been interpreted as marking the transition from one Blytt/Sernander stage to the next (cf. Wendland and Bryson 1974:14). This is possibly a result of Bryson's acceptance of the Blytt/Sernander scheme.

The palaeoclimatic information available concerning the Holocene (cf. Dansgaard _et al_. 1969; Flint 1971; Frenzel 1968, 1973; Gerasimov 1969; Guilcher 1969; Hare 1953; Higgins 1969; Lamb 1969; Morner 1971), seems to indicate that this period was marked, at least in the Northern Hemisphere, by climatic instability. While curves of Holocene sea level changes are asymptotic or nealy so, implying that glacial melting occurred at a continuous rate, it is possible that some fluctuation took place (Flint 1971:327-8). Eustatic changes are characteristic of this time

TABLE III

The Northern European Mesolithic Sequence

(Clark 1936:53)

Geo-chronology	Glacial eras	Land movement		Climate phases	Forest development	Fauna	Archaeology	
		Baltic	North Sea					
B.C. (2500)	POST-GLACIAL	*Litorina* Sea	Fen clay laid down	SUB-BOREAL			NEOLITHIC	
3000			Transgression of North Sea bed	Warm and moist-oceanic		Dog	MESOLITHIC	PERIOD III
4000				ATLANTIC Warmth maximum Temperature (July) 17° C.	Alder and/or oak-mixed-forest (elm, oak, lime) dominant	Forest, lake and sea forms Elk rare Reindeer absent		
5000		*Ancylus* Lake		Temperature (July) 16°–17° C. BOREAL Warm and dry-continental Temperature (July) 12°–14° C.	Birch and/or pine dominant Alder and oak-mixed-forest coming in Hazel becomes important near the end of the period	Dog Forest and lake forms Elk very common Reindeer survived		PERIOD II
6000			'Moorlog' forming					
(6800) 7000	FINIGLACIAL			PRE-BOREAL	Birch, pine and willow the only forest trees	Mixed tundra and forest forms		PERIOD I
8000 (8300)		*Yoldia* Sea		Gradual and rapid rise of temperature from 8° to 12° C. (July)		Lemming absent		
9000 10000	GÖTIGLACIAL	Ice-dammed Lake		SUB-ARCTIC ARCTIC	*Dryas* flora Dwarf birch and willow	Tundra and steppe forms Lemming	PALAEO-LITHIC	

interval, vertical displacements of the sea surface that are simultaneous over the entire world (Bloom 1971:356). Isostatic rebound of land surfaces is also observable and hypothesized to have occurred at an exponential rate (Bloom 1971:356). Mesolithic settlements were characteristic of a period of time which Farrand has labelled a 'deglacial hemicycle'-"that time between the initial withdrawal of ice from the outermost moraines to the time of complete disappearance of the continental ice sheets" (Bloom 1971:357).

Gerasimov feels that correlations of zones marginal to the last Scandinavian ice sheet demonstrate that it melted at different rates in various places, dependent mainly on local conditions, not major climatic ones (Gerasimov 1969:73). Therefore local geological and geomorphological events should be examined rather than widespread ones.

One crucial area for the northwestern European Mesolithic is the Baltic Sea, where physical changes which were once the sole mechanism for relative dating of early Holocene events are well documented. During the immediate postglacial the Yoldia Sea was created, which was named after the mollusc *Yoldia arctica*, found only in arctic waters, and now subsumed under the species *Portlandia arctica* (Flint 1971:611). This animal, which at present is found only in arctic waters, characterizes a condition which lasted about one thousand years in this region (Flint 1971:612).

When the outlet via Southern Sweden was closed as a result of isostasy, a lake was recreated, the Ancylus, named after the mollusc

Ancylus fluviatilis which existed here for the next two thousand years (Flint 1971:612). Wile at first the lake drained westward through a channel across Swedent, eventually the outlet shifted to the Oresund (Flint 1971:612).

When a rising sea level submerged the Oresund, the Littorina Sea was formed (named after the common perwinkle, Littorina littorea, which is abundant in deposits of this age [Flint 1971:612]) ..This marked the onset of Atlantic conditions as well (Jessen 1935:188). The marine malaco-fauna represents saltwater conditions warmer than those of the preceding Yoldia Sea (Flint 1971:612). The Littorina Sea existed for approximately three thousand years after which the modern Baltic Sea appeared (Flint 1971:612). It is notable that the conception of the development of the Baltic Sea has changed only minimally from that of the 19th century geologists such as de Geer who originally formulated it.

The early postglacial was therefore a time of marked temperature oscillations and sea level fluctuations, as well as documented vegetational changes and faunal extinctions, although the latter were more limited here than in the Americas (cf. Kowalski 1967). Kowalski (1967) for one has argued that faunal extinctions in the early postglacial of Europe were limited to six species: the mammoth (Mammuthus primigenius), the woolly rhinoceros (Coelodonta antiquitatis), the Irish deer (Megaceros giganteus), the cave bear (Ursus spelaeus), the cave lion (Panthera spelaea), and the cave hyaena (Crocuta spelaea)(Kowalski 1967:354-5). The major change documented for the early postglacial was the breakup of the peculiar steppe/tundra faunal groupings which existed during the late Würm (cf. Kowalski 1967; Vereschagin 1967).

The natural conditions described here might result in decreasing success in predicting the environment in terms of changing seasons and years, and therefore result in alteration of the adaptive pattern (C. Schweger, personal communication). The Mesolithic is quite clearly an adaptation to fluctuating environmental conditions; in a way it may have been a specialization for non-specialization. It is marked by reliance on a wide variety of natural resources, in fact by a broad-spectrum adaptation (Flannery 1969:77). Such a lifestyle might be well suited for an environment in which the predictability of future natural events was comparatively low. In this light the Mesolithic adaptation can be seen as insurance against the peculiar environmental situation which existed in Europe at the time. Before the early Holocene, there was a selection for particular species of animals over others; after this time there was a major reliance on a single mode of production, agriculture, which required the manipulation of a number of specific plants and animals. In this way the environmental directive given to prehistorians functions to provide a series of explanations for the unique nature of early postglacial human behaviour (cf. Binford 1968a).

One additional concern of the palaeobotanists has become important for Mesolithic research; that of the nature of possible human influences on the direction of formulation and maintenance of a given floral environment (cf. Simmons 1969; Smith 1970). While it has long been felt that Neolithic and later agriculturalists had a direct impact on vegetation, it was argued that Mesolithic adaptations would not have induced any changes that would appear statistically on a pollen diagram. It is now recognized that selection of particular species for food resoueces (such as Corylus nuts), or use of particular mechanisms for environmental exploitation (such as fire), could explain observed changes in the palynological record, at least of the British Isles, in Mesolithic times (Smith 1970:82,93).

In this way it can be argued that palaeoenvironmental research has influenced the direction of Mesolithic studies in Europe to the point where the interests of prehistorians have been effectively subsumed under those of general Quaternary specialists, thereby creating the opposite of the supposed norm of archaeological research recently presented by Karl Butzer (1975). In addition, it should therefore not come as a surprise that the 20th century leaders of Mesolithic research are in the forefront of the development of an ecological approach to prehistory, also known as bioarchaeology (Clark 1972b:15).

Chapter IV

The Nature of the Mesolithic: Economy and Technology

> It seems that the Mesolithic stage resulted from the adaptation of Late Palaeolithic tundra communities to the newly-risen ecological conditions that is to the forest which had grown in the European lowlands during the early Holocene. Important environmental changes which took place at the turn of the Late Glacial and Post Glacial forced the original inhabitants of the Lowland to emigrate or to adapt themselves. The adaptation meant a switch to the only available kind of economy, i.e.-the Mesolithic type of economy. In contrast to the Mediterranean countries, the poor soil of the European Lowland did not create favorable conditions for a direct change from the Palaeolithic to the Neolithic economy (Kozlowski 1973a:332-3).

Mesolithic research has historically operated under a basic contradiction. It is necessary to analyze early postglacial societies in reference to what preceded them both temporally and spatially, but it has proven impossible to do this in any systematic way. J. Tixier (1963), G. Laplace (1954), and D. de Sonneville-Bordes and J. Perrot (1953), have all created analytical methods to deal with Leptolithic (Upper Palaeolithic and Mesolithic) industries, but the two are still basically divided. To some extent this problem is eliminated by the new system formulated by Laplace (cf. Laplace 1958, 1966), but this as yet has not received widespread acceptance except in Italy, although it is becoming increasingly popular in Iberian research.

> The anthropological value of the archaeological record in Europe from, say 15,000 to 5,000 B.C. lies in the fact that it provides an almost unbroken series of clues to the ways in which socio-cultural and cultural-ecological change takes place within the context of a constantly transmuting natural environment; and any gross break-

> down of this important continuum into arbitrary units, one of which (the Mesolithic) is crammed with ("post-Pleistocene") adaptations, while the other (the late Palaeolithic) is not, is quite literally masking and obscuring a considerable amount of valuable information (Czarnick 1976:65).

Stanley Czarnick's recent statement clarifies what has been apparent for a long time. But although at present a general continuum is perceived which culturally overrides a Pleistocene/Holocene boundary, in practice this division is a real one in terms of research. It is efficient to treat the Mesolithic in Europe as distinct from the Palaeolithic, even though logic argues against it.

Mesolithic industries are defined by the high percentages of microlith tools in individual assemblages. This feature seems to be the general case although not all microliths can be safely labelled Mesolithic. Conversely, not all Mesolithic assemblages contain microliths (for example, the Larnian and the Asturian as described in Table IV). Combinations of microlithic and macrolithic elements serve to define some industries, such as the Maglemosean, while certain macrolithic types themselves are fossiles directeurs of particular traditions (such as the axe/adze tradition of the Northern European forest which serves to oppose Maglemosean industries from non-axe ones such as the Tardenoisian). It is apparent that the Mesolithic generally cannot be adequately defined solely be reference to lithic assemblages. At this point the economic variable enters the scene.

The classic model of the Mesolithic sequence is one attuned to fundamental environmental change (as described by Kozlowski at the beginning of this chapter), best represented by the Maglemosean/Ertebølle transition. The Ertebølle is considered here to be synonymous with the Danish term kjøkkenmøeddinger or roughly 'kitchen midden' (cf. Bray and Trump 1970:81-2). It is classically of Atlantic age (while the Maglemosean is mainly Boreal but also Preboreal); and in certain places may be marked as well by the incursion of pottery, animal domesticates or other Neolithic elements (cf. Troels-Smith 1966/7). The term kjøkkenmøeddinger is used here since by convention it serves to separate the two basic kinds of coastal settlement in Danish Atlantic times. First is an early coastal settlement culture, the Kongemose, which might seemingly be labelled Maglemosean in economic terms, and second is the true kitchen middens which made use both of marine and terrestrial fauna (cf. Brinch-Petersen 1973 for detailed descriptions of these cultures, also Table IV).

Models used to explain Mesolithic 'ecological adaptations' come from two distinct geographical areas. The first is the Danish Maglemose/Kongemose/Ertebølle sequence; the second comes from the Near East and other semi-arid areas. Both may be only artifacts of preservation; different physical conditions in each led to the retention of organic remains through time which give a detailed insight into economic lifeways. Common perceptions of Mesolithic adaptations rely on one or more of these areas, often unknowingly, and it is here that confusion begins. Both imply some sort of postglacial readaptation to temperate conditions of the Holocene (cf. Czarnick 1976:61), implying that monumental ecological and cultural change took place. But the classic broad-spectrum adaptation model of early postglacial times (cf. Binford 1968a; Flannery 1969) was first articulated for the 'Archaic' of the Tehuacán Valley of Mexico (cf. FLannery 1966), then secondarily for the 'pre-Neolithic' of the Deh Luran of Iran (cf. Flannery 1969; Hole, Flannery and Neely 1969). Neither of these areas would necessarily have experienced the same kind of postglacial changes that Northern Europe did, since the areas concerned were never located near a major centre of glaciation in the Late Pleistocene. But vegetational change is documented from the palynological record of the Near East (cf. van Zeist), and sea level changes resulting in adaptational shifts can be seen in the Romanellian prehistoric record (cf. Durante and Settepassi 1972). These changes in Mediterranean Europe and the Near East must be examined and will probably shed light on Epipalaeolithic cultural adaptations in the area. The Lake Zeribar core from the Near East, for example, reveals the existence of an open Artemisia and Chenopodiaceae steppe lasting from 22,500 to 14,000 B.P. (van Zeist 1969:40). From 14,000 B.P. on, annual precipitation and temperature increased, but from 10,000 to 8,000 B.P. vegetation was more open than after 6,000 B.P. (van Zeist 1969:44). Between 10,000 and 6,000 B.P. autumn, winter and spring precipitation was not less than at present, but summer dryness is revealed (van Zeist 1969:45). This latter situation would not affect annuals such as wild cereals, for instance wild einkorn (Triticum boeoticum), wild emmer (Triticum dicoccoides), and wild barley (Hordeum spontaneum)(van Zeist 1969:44-5). Therefore the areas which in early postglacial times provided habitats for these species were similar to the present day ones (van Zeist 1969:45).

The acceptance of a 'readaptation' model relies on a perception of alternating warm and cold conditions which one repeatedly replacing the other. Such a model argues for the existence in Europe of stages such as the Allerød and Bølling oscillations of the late Würm, which would influence the direction of responsive cultural change in both the economic and technological spheres. An argument in this vein is presented for the Ahrensburgian/early Mesolithic/Hamburgian sequence at Stellmor, near Meiendorf, Germany (cf. Roe 1970:92; Schild 1976). It is therefore imperative to examine the nature of cultural behaviour in temperate areas south of the extensive steppe/tundra belt of late Würm Europe. At present this situation can only be examined critically in one area, Cantabrian Spain, but the examination may also assist in the explanation of Romanellian patterns in Italy (cf. Durante and Settepassi 1972).

It is hypothezied here that the Azilian (present in Cantabria and the Pyrenees) might best be defined as a temperate Upper Palaeolithic adaptation. Its salient characteristics are given in Table IV. Perhaps all Mesolithic industries could best be described in these terms since their typological and faunal complements most closely resemble the Epipalaeolithic ones. Azilian industries are usually seen as belonging to the Allerød climatic phase, an assignment that may be a result of research focus. If an archaeological site is located which contains a 'temperate fauna' (one lacking any of the characteristic steppe/tundra forms), and a microlithic assemblage and is datable to the Pleistocene/Holocene intersect, it is more often than not considered to be of Allerød age. Given this model, a penetration can be seen in "Allerød times" of Mesolithic (Romanellian) peoples from the Mediterranean area into France along the Rhône River valley (cf. Maps 9 and 10), and this in fact is the way in which these sites have been interpreted (cf. Delibrias and Evin 1974, Desbrosse and Giraud 1974).

> Il apparait wu'une 'influence azilienne' est sensible dans le Magdalénien final des Pyrénées et Cantabres dès le Dryas Moyen; l'Azilien se developpe en cette region dès le debut d'Allerӧd, alors que le Magdalénien perdure dans le centre de la France. Des industries épipaléolithiques apparaissent alors dans la vallée du Rhône (Leroi-Gourhan 1971:254).

J.H. Mercer suggested that the prevailing westerly winds in late glacial times brought about a rapid breakup of the Arctic shelf ice, thus bringing very cold maritime air over the continent during the European Younger Dryas (Jessen Zone III)(Frenzel 1973: 69). Therefore only in Western Europe is the oldest past of the true postglacial warming trend separated by the Younger Dryas and the Older Dryas so as to appear as a true interstadial, the Allerød (Frenzel 1973:69; Mercer 1969). Mercer's argument was directed primarily at North American scholars who were searching for an analogue of the Allerød in that continent. If his argument is acceptable, it questions the existence of an Azilian cultural phase in Mediterranean Europe which could be assigned to the Allerød.

There is a basic problem concerning the nature of human adaptation in Cantabrian Spain during the late Würm; a time when Magdalenian societies existed in France. Leslie Freeman has done research on previously excavated sites in the area and assigns the term Magdalenian to levels with faunal remains quite similar to those expected in Mesolithic sites (Freeman 1973:32). The only full glacial forms listed are reindeer (*Rangifer tarandus*), found rarely at Castillo levels h and f and Valle; rhinoceros, present at Valle, and mammoth (*Elephas primigenius*) present at Altamira (Freeman 1973:32). Of these sites, Altamira is the only one which lacks a level assigned to the Azilian (Freeman 1973:32).

Cultural designations here are admittedly questionable. For example, the Castillo f Magdalenian level was mized with an Azilian, and only two faunal forms (*Cervus* sp., *Rangifer* sp.) were found at the same site (Freeman 1973:34). Add to this the argument that these two levels are difficult to distinguish on lithic grounds, and the entire assessment is thrown into question;

> In Cantabria, Azilian assemblages are so similar to late Magdalenian ones if one ignores the bone/antler harpoon shapes that it seems best to include Azilian occupations with Palaeolithic levels, rather then [*sic*] setting them off as a special category (Freeman 1973:5).

The fauna from Azilian sites is also poorly known. Species included in Freeman's chart for this culture are all present on the Magdalenian chart as well, except for Panthera pardus, marked as present at the La Riera site (Freeman 1973:32,37). Freeman in turn lists the Azilian as present at the sites of Castillo, Morín, Otero, Pena de Candama, La Riera and Valle, all of which contain Magdalenian levels (Freeman 1973:7).

The fundamental question lies in the nature of the Magdalenian and the Azilian in Cantabria, especially in the extent to which the two can be differentiated. The use of these French terms implies acceptance of them in the full range of their meanings, the first as a steppe/tundra adaptation, the second sa a temperate one, and does not account for the cultural manifestations present in these sites.

The nature of the French steppe/tundra in the late Würm is itself still poorly understood. It is claimed by Arlette Leroi-Gourhan that hazel (Corylus sp.) and Quercetum mixtum elements maintained themselves in the north of Frnace and in Belgium during the Würm (Leroi-Gourhan 1971:250). These forms would have been able to extend themselves from here in what Leroi-Gourhan calls periods of warming or warmth (rechauffement)(Leroi-Gourhan 1971:250). If observed in the palynological record, these changes might well be interpreted as general warming trends, while in fact only representing local phenomena.

To what extent might what is called the Allerød be the result of such observed, but minor natural behaviour? Arlette Leroi-Gourhan reports that no palynological records exist for Southern France and Cantabria which would aid in its delineation there (Leroi-Gourhan 1971:250). She, as well as Freeman, documents the difficulty of differentiating the Azilian from the Magdalenian on technological and typological grounds (Leroi-Gourhan 1971:253). For example, both the Magdalenian VI of El Otero and the Magdalenian V-VI sequence of La Vache contain Azilian harpoons (Leroi-Gourhan 1971:253).

The problem of the Azilian/Magdalenian transition in Cantabria serves to illustrate the nature of the Upper Palaeolithic/Mesolithic boundary in this area. That nature is completely unknown and inexplicable given present models of human behaviour. In addition, the nature of environmental change which marks the Pleistocene/Holocene boundary is unclear. It was originally seen as catastrophic, but Butzer for one sees a gradual change which began with the Allerød (Butzer 1971:530; Czarnick 1976:62-3). It is apparent that the delineation of early postglacial environments in Mediterranean Europe must take place before the cultural record can be understood, and perhaps the prehistoric remains could be utilized to assist in the task.

The maps presented in the appendix reveal a regular curve of Mesolithic site frequency over time with the highest number occurring betwhen 6000 and 9000 B.P. (cf. Maps 4,5,6,7). The location of sites demonstrates the regularity of settlement in northwestern Europe, as well as its close proximity to large bodies of water.

The first so-called Mesolithic sites (or more properly Epipalaeolithic ones) are found in North Africa and the Near East, then in Mediterranean Europe. The maps reveal a regular movement over time from south to north as climatic conditions ameliorated. This may in some instances reflect actual population movement, but it more likely represents a shift from steppe/tundra to temperate conditions, which appears in the archaeological record as a change from 'Upper Palaeolithic' to 'Mesolithic' type sites. Compared to the distribution of sites in the Upper Palaeolithic, there seems to be more settlements in Mesolithic Europe, possibly as a result of seasonal migrations in order to utilize particular resources only available at some times of the year.

Table IV, found at the end of this chapter, consists of various descriptions of the major cultural traditions and/or areas which are generally subsumed under the category of Mesolithic. Most are self-explanatory, but the following notes are in order.

The Danube River valley site of Lepenski Vir in Yugoslavia is admittedly Mesolithic since, lacking a Neolithic economic foundation and polished stone implements, it cannot be classified as anything else. It is proof of the ability of certain Mesolithic adaptations to provide a permanent subsistence base, and brings to mind the rich food collecting sites of the ethnographic present of the North American Northwest Coast. It demonstrates quite clearky the argument presented by Hassan (1973:535-6) which states that when resources are concentrated, large groups of seasonally permanent settlements are possible. Lepenski Vir exhibits a high degree of internal planning, conformity, and a continuity of tradition which is markedly different from the subsequent Starcevo-Körös-Çris occupation (cf. Bokonyi 1970; Sréjovic 1969, 1970).

The two *kjøkkenmøeddinger* of Téviec and Hoëdic in Brittany have been variously ascribed to categories such as a 'Breton Tardenoisian' (Gabel 1958a:659), or to conventional terms such as Sauveterrian (Rozoy 1973:358) and plain Tardenoisian (Gabel 1958a:663). These island occupations near Morbihan reveal the dangers inherent in labelling assemblages of this period as industrially distinct while they remain virtually identical economically (cf. Péquart and Péquart 1928, 1932, 1934, 1937). There is a profound necessity for cultural typologies which combine more than just one element of classification.

These two sites should not be subsumed under the standard French sequences since little is known about the economic parameters of the Sauveterrian and the Tardenoisian themselves, or even concerning their relationships to each other. For this reason, these sites have been placed in a separate and distinct category.

The Near Eastern and North African cultural tradiitions are included here since these have been historically trated as classic Epipalaeolithic manifestations, and, unlike other non-European hunter/gatherer sites, may indeed warrant the designation of Mesolithic. The Maghreb industries, the Iberomaurusian (or Oranian), the Capsian and the Neolithic of Capsian Tradition, represent adaptations to a number of environmental zones. Despite these environmental differences, the cultural patterns are very similar to those of Mediterranean Europe at the time. Considered together, these may in a human ecological since demarcate a cultural zone characteristic of the early Holocene circum-Mediterranean, the critical factors of which have not been worked out as yet. The North African industries should also be included since they form the basis of classification for all other Mesolithic ones (cf. Tixier 1963; Groupe d'étude de l'Epipaléolithique-Mésolithique 1969; Rozoy 1967a, 1967b, 1968a, 1968b).

The Nile Valley sequence (especially Kom Ombo) is included mainly for historical reasons. This sequence should not be labelled Mesolithic in its narrow sense (as a postglacial phenomenon initially requiring glacial impact on the environment), but represents in turn identical industries (on typological and technological grounds), and is characteristic of a series of long standing broad-spectrum riverine oriented adaptations dating between 15,000 and 10,500 B.C. (Churcher and Smith 1972:259; cf. also Lubell 1974; Marks 1968a, 1968b; Phillips 1973 and Table IV).

The Near Eastern sites are so entwined with the broad-spectrum adaptational model of Mesolithic economy that they cannot be ignored. Here, at least in the Natufian sites, is documentation for Flannery's presumed extended tradition of experimentation with the natural environment which eventually resulted in plant domestication (cf. Garrod 1932, 1937; Butzer 1971:541).

There is one additional problem with the Mesolithic which is not treated in Table IV. The Mesolithic concept itself has priority for the Indian subcontinent. Here the sites are completely different, yet are at least microlithic (cf. Gordon 1960; Joshi 1968; Misra 1973; Todd 1950). The lack of observed major environmental change at the Pleistocene/Holocene boundary in India may be the reason that A.C.L. Carlleyle was successful in arguing the lack of a cultural hiatus here (Carlleyle in Wilson 1893:456). In many areas of the subcontinent only lithic remains are preserved, but in the northwest at least, considerable faunal evidence has recently been recovered (Jerome Jacobsen, personal communication). It is not clear what the latter will represent. Jerome Jacobsen, who has worked first hand with this material, feels that the term Mesolithic is provisionally acceptable until more is discovered about the nature and range of early post-Pleistocene adaptations in SOutheast Asia (J. Jacobsen, personal communication). These latter would properly form a better medium of comparison for Indian than Europe does.

In conclusion, the Mesolithic is therefore a wide ranging concept which covers a vast temporal and geographical span (cf. maps in the appendix). While its distribution has been well defined, its nature remains poorly known, and models proposed to explain it have changed only minimally in the last fifty years. An hypothesis will be proffered in the next chapter which presumes to describe and explain most of the European Mesolithic information presented in Table IV.

Table IV

Cultural Designations for the European and Circum-Mediterranean Mesolithic

Cultural Designation or place	Description
Azilian	-located in southern France, northwest Spain; site of Mas d'Azil as the type (cf. Piette citations) -as the *phase de transition* occurring at the beginning of the Holocene (Déchelette 1924:43) -as part of a general early Mesolithic (Gabel 1958a:659) -could be called Palaeolithic, but most of the characteristic animals of the full glacial have disappeared (Macalister 1921:525) -influence of the Azilian can be seen in the Final Magdalenian of the Pyrenees and Cantabria from the middle Dryas; Azilian itself from the beginning of the Allerød (Leroi-Gourhan 1971:254) -Coutil felt that there were initial 'pre-Tardenoisian' sites in France with Azilian or post-Magdalenian facies, with terrestrial snail shells and in some cases, reindeer (*Rangifer tarandus*) remains (Coutil 1912:306) -remains of animals at Mas d'Azil include red deer, chamois, aurochs, horse, common (brown?) bear, boar, badger, wild cat, beaver, trout, pike, cyprine fish, frogs, birds (Piette 1895a:279) -tools of Magdalenian type; triangles and 'battered backs' present (Piette 1895a:279; Clark 1952:36) -an Epipalaeolithic industry; a virtual extension of the final Magdalenian (Escalon de Fonton 1974:65) -trapezes absent (Breuil 1912:223; Sollas 1924:602); geometric microliths may or may not be present (Malvesin-Fabre 1954:67)

Table IV Continued

Cultural Designation or place	Description
Azilian	-microburin technique absent (Clark 1955:17) -flat, perforated *Cervus elaphus* harpoon as *fossile directeur* (Piette 1895a:279; de Sonneville-Bordes 1960: 24) -harpoons as 'epi-Magdalenian' (Escalon de Fonton 1974:65) -presence of Azilian harpoon felt by Coulonges to be insufficient for assignment of this cultural designation (Coulonges 1963:6) -these harpoons have been found with a geometric industry at Valle, Spain, with Swiss Tardenoisian (Coulonges 1963:6), also with the Magdalenian VI of El Otero, Magdalenian V and VI of La Vache, both in Spain (Leroi-Gourhan 1971:253) -engraved and/or painted pebbles (Breuil 1912:216-7; Burkitt 1925:143; Cook 1903; de Sonneville-Bordes 1975:107) -no woodworking tools (Childe 1931:326) -known from Les Eyzies in the Abri du Chateau where found with *Helix nemoralis* (de Sonneville-Bordes 1960:472) -known from Abri Corneille, assigned to a temperate humid climatic phase at the end of the Würm (de Sonneville-Bordes 1960:57) -located here with bovid remains, both *Equus hydruntinus* and *E. caballus*, some *Cervus elaphus*, perhaps *Capreolus capreolus*, some remains of boar, sheep/goat, rabbits, birds (de Sonneville-Bordes 1960:48) -found in beds 6 and 8 of Le Roc Allan where called *langueroquienne* (Coulonges 1935:37, 1963:4); with Magdalenian-type lithic industry, without painted pebbles or harpoons (Coulonges 1935:37-8)

Table IV Continued

Cultural Designation or place	Description
Azilian	-called Dordogne Azilian, resembling more Upper Palaeolithic and Sauveterrian traditions than Azilian ones (Coulonges 1935:37-8) -Azilian level with a Palaeolithic flavour at the Haut Agenais; has nothing in common with Mas d'Azil type, found with red deer, aurochs, horse, rabbits, beaver (Coulonges 1954:70) -Azilian level of La Colombière dated at 11,660±240 B.P. (Ly-725) and assigned to the Allerød (Desbrosse and Giraud 1974: 488-490) -reindeer as most important species here, followed by horse; marmot also present (Desbrosse and Giraud 1974:486,490) -Azilian at Valle, Spain with red and roe deer, chamois, aurochs, boar; *Helix* sp. in upper layers; Azilian harpoons (Breuil and Obermaier 1912:2-3; Coutil 1912:325) -underlies 'Asturian' at the caves of La Riera and Balmou in Eastern Asturias (Clark 1971:1245) -fauna and lithics of Magdalenian in Cantabria virtually indistinguishable from Azilian here (Freeman 1973:32,33,36) -Azilian best described as Palaeolithic in Cantabria (Freeman 1973:5)
Arisian	-bed of *Helix nemoralis* shells and implements immediately overlying Azilian at Mas d'Azil; from the Arise River near the site (Laplace 1953:199; Sollas 1924:601) -may represent nothing more than a shell collecting part of the Azilian since not identified elsewhere (Laplace 1953:200)
Arudian	-from a cave "sur les flance escarpées du Poeymaü (Laplace 1953:200)

Table IV Continued

Cultural Designation or place	Description
Arudian	-found here in a *Helix* level; poorly known (Laplace 1953:206,209) -a development from the Azilian in the Atlantic zone of the Pyrenees (Escalon de Fonton 1974:81)
Sauveterrian	-defined by Laurent Coulonges at the Abri du Martinet (Sauveterre-la-Lémance)(Cauvin 1971:17) -associated here with red deer, beaver, wild cat, aurochs, boar, *Helix nemoralis* (Coulonges 1928:500) -stratified here above *éboulis* covering Upper Magdalenian, *éboulis* assigned to Bølling and Allerød (Cauvin 1971:17) -stratified under Tardenoisian (Coulonges 1928:496) -geometric microliths as distinguishing markers; most of the remaining tools are Palaeolithic in character (Cauvin 1971:21) -distinguished from Tardenoisian by the absence of trapezes, importance of triangles (Cauvin 1971:21) -Rozoy sees evolution in the Sauveterrian from sites of the Massif Centrale from phases without trapezes to one with them and Montbani blades and bladelets (Rozoy 1971:352) -as early in Gabel's sequence (Gabel 1958a:659) -as Epipalaeolithic (Clark 1955:17) -Waterbolk feels that the Sauveterrian and the Tardenoisian are "less specialized" than the Maglemosean; represent game hunting adaptations where fishing not important; settlements in hilly areas and cave sites (Waterbolk 1968:1095) -at Le Roc Allan, Sauveterrian stratified between Azilian and Tardenoisian (Cauvin 1971:22; Coulonges 1935:34); associated with level of ash, river pebbles, animal bones and many *Helix nemoralis* shells,

Table IV Continued

Cultural Designation or place	Description
Sauveterrian	similar to the Sauveterrian of Le Martinet (Coulonges 1935:39) -found with temperate fauna at both Haut Agenais and La Borie del Rey (Coulonges 1935:39, 1963:24) -British sites assigned to this category are late in the sequence (Jacobi 1973:239) -found at Shippea Hill, and assigned to the early Atlantic (Clark 1955:3,5) -also at Peacock's Farm site where no woodworking equipment found, but many microliths (Clark 1955:12)
Tardenoisian	-industries with a preponderance of trapezes in the microlith assemblage (Cauvin 1971:33) -found in Belgium and France -Rozoy feels it should represent all microlith assemblages in the Tardenois (Rozoy 1971:346) -name Tardenoisian from G. de Mortillet for the entire region (Coutil 1912:301; Daniel and Vignard 1954:74) -two facies -first or Coincy facies-without trapezes; second as Montbani facies-with trapezes, made on blades or bladelets of Montbani style, showing evolution from middle stage of Epipalaeolithic to late stage, to final stage of Allé Tortue type (Rozoy 1971:351, 1973:504) -Allée Tortue at Fère-en-Tardenois, known from Vielle (1890)(Parent 1967:187) -trapezes (Parent 1967:199,207) -retouch similar to Tixier's Ouchtata (cf. Tixier 1963:48) but frequently inverse (Parent 1967:194) -possibly late Tardenoisian with Danubian influences (Parent 1967:207) -Octobron saw the confusion of "geometric microliths" with "Tardenoisian" (Octobron 1922b:230; cf. Childe 1957:5, 1958:23) -proposed as Mesolithic all industries

Table IV Continued

Cultural Designation or place	Description
Tardenoisian	of the final or post Palaeolithic, Tardenoisian and ones with survivals of Tardenoisian, also Azilian (Octobron 1925:61) -contrast of 'plus axe' and 'minus axe' sites may be erroneous (Rozoy 1973:515) -Tardenoisian as early in Gabel's sequence (Gabel 1958a:659), as Epipalaeolithic in Obermaier's (1924:323) -Coulonges sees the Tardenoisian as the bridge between local traditions and Neolithic ones (Coulonges 1935:25, 1954:70)
Tardenoisian of Neolithic Tradition	-Daniel and Vignard (1954:74) argue that the original definiton of the Tardenoisian by de Mortillet referred to a Neolithic tradition -a local tradition base on to which elements of Neolithic (at least animal domestication) were grafted -now restricted to the south of the Paris basin; comprised in lithics of evolved armatures with flat inverse retouch (Rozoy 1973:510)
Hoëdic/Téviec	-two kitchen middens off the coast of Britanny near Morbihan (Péquart and Péquart 1928:479, 1932:209) -Gabel calls these Breton Tardenoisian, as such are late in his sequence (Gabel 1958a:659) -at Téviec, only a few fish remains compared to molluscs and crustaceans (Péquart and Péquart 1937:12) -industries as either Tardenoisian (Gabel 1958a:663) or Sauveterrian (Rozoy 1971:358)
Larnian	-Irish Mesolithic, some intrusion into Scotland

Table IV Continued

Cultural Designation or place	Description
Larnian	-Mitchell sees three Larnians, a Boreal, an Atlantic and an Ultimate Larnian (Mitchell 1971:274) -Early Larnian as an Upper Palaeolithic descendant, Late as a local development (Movius 1942:120,170) -shift from forest activities to coast paralleling the Maglemosean/early coastal one (Movius 1942:176; Gabel 1958a:664) -Early as blade industry, Late as a heavy flake one characterized by Larne picks (Movius 1942:148,159,166) -Early as Gabel's early phase, Late as late in his sequence (Gabel 1958a:659) -Late diffuses to Scotland, called 'epi-Mesolithic' (Lacaille 1954:138,313) -little known which would verify or disprove economic hypotheses(Woodlam 1973/4:3) -coastal midden sites as seasonal (spring, early fall) on the basis of bird bones (Woodman 1973/4:14) -site of Mountsandel as "pre-Larnian", a winter site (Woodman 1973/4:14.15)
Obanian	-coastal late Mesolithic Scottish shell middens -Boule argued that this was a coastal variant of the Arisian since both made use of molluscs or snails (Boule 1896:324) -flat harpoons at Oban type site, similar to Azilian (Déchelette 1924:321) -used whales and seals (Clark 1952:69,73) -Obanian affinities strongest to Baltic Mesolithic, an Atlantic maritime economy (Gabel 1958a:664) -Gabel's (1958a:659) late phase -yields evidence of transition to Neolithic (Waterbolk 1968:1100)

Table IV Continued

Cultural Designation or place	Description
Maglemosean	-located on the northern European plain, when east of Baltic, called Kunda -type site as the Magle mose at Mullerup, excavated by Sarauw (Clark 1936:86, 1967:94; MacCurdy 1924:11) -recognized by Sarauw to have strong affinities to the Upper Palaeolithic of Western Europe (Waterbolk 1968:1095) -particularly good preservation in Maglemosean sites felt to make "the remaining Mesolithic groups appear anemic" (Gabel 1958a:660) -as Gabel's (1958a:659) early phase -microlith industry and heavy woodworking tools (Gabel 1958a:660; Waterbolk 1968:1095) -bone/antler tools including distinctive harpoons -all Boreal and early Atlantic sites in Denmark are inland ones (K. Roselund in Brinch-Petersen 1971:60) -typically Boreal, but may be Preboreal in places (eg. Star Carr)(Childe 1958:28; Shetelig and Falk 1937:8) -Childe argued for the possibility of a coastal Maglemosean from which the Ertebølle developed (Childe 1958:30) -part of the 'axe cultures'; union of these and the 'microlithic cultures' (Clark 1936:xiii,xv) -lakeside settlements (Clark 1967:94) -continuity of tradition in woodworking tools with the Ertebølle (Clark 1967:94) -differences between the Tardenoisian and Maglemosean are ones of degree rather than kind (Newell 1973:426) -Tardenoisian in northwest Europe refers to non-Maglemosean sites (Newell 1973:429) -Maglemosean as Epipalaeolithic to Obermaier (1924:323) -increased importance of collection of wild fruits and berries, waterfowl hunting and fishing towards end of the Boreal (Waterbolk 1968:1096)

Table IV Continued

Cultural Designation or place	Descriptions
British Maglemosean	-as part of northern European plain Maglemosean tradition until Littorina transgression which broke off land bridge in the North Sea (Childe 1931:326, 1937:240; Clark 1936:124) -Thatcham, a number of Mesolithic campsites on edge of a gravel terrace bordering a reed swamp (Churchill 1962:362) -use of mammals, fish, birds, molluscs (Wymer 1962:355) -Star Carr as Preboreal winter campsite with birch platform for stabilization of the swamp (Clark 1954: 9,16,58,95,179) -earlier than classic Maglemosean but closest to it (Clark 1954:180) -Deepcar, over 1000' elevation, non-geometric Maglemosean with rare flint axes (Radley and Mellars 1964:21-2) -Broxbourne-microliths and flint axes, therefore called Maglemosean (Warren et al. 1934:110,115) -early Mesolithic in Britain of Maglemosean affinities, later is Sauveterrian or Tardenoisian (Jacobi 1973:239) -evidence of economic change difficult to document (Jacobi 1973:250) -Star Carr model of seasonality (winter in lowlands, summer more free ranging into highlands) widely applied, but not useful for Irish Mesolithic sites (Woodman 1973/4: 14)
Kongemose	-also called Carstensminde or Early Coastal culture (Clark 1962:108) -intermediate in many ways between Maglemosean and Ertebølle -similar to latter in bone tools (Brinch-Petersen 1973:92) -both inland and coastal sites (Brinch-Petersen 1973:95) -only one kind of mollusc in Kongemose sites (Brinch-Petersen 1973:106-7)

Table IV Continued

Cultural Designation or place	Description
Kongemose	-Childe argued for Maglemoseans developing an increasingly sedentary way of life on the coast which eventually becomes Ertebølle (Childe 1958:30) -sea coast occupied by 'different' peoples at the same time as the Maglemoseans in the interior (Klindt-Jensen 1957:30) -characterized by rhomboid microliths, oblique arrowheads; more like Ahrensburgian than Maglemosean (Klindt-Jensen 1957:30) -occasional lake settlements such as Kongemose itself (Brinch-Petersen 1973:96; Klindt-Jensen 1957:30) -identical to Maglemosean sites in spatial orientation, but lacks fishing gear, fish remains (Brinch-Petersen 1973:96) -coastal ones were summer occupations, where fish and sea birds were most important, some forest species present (Brinch-Petersen 1973:93) -only one site associated with shell midden (*Ostrea edulis*) Brovst, Zealand; others are just coastal sites (Brinch-Petersen 1973:96) -Bloksbjerg, north of Copenhagen, with two levels, upper a kitchen midden; lower of pine/mixed oak date, no economic information, but called intermediate between Maglemosean and Ertebølle (Klindt-Jensen 1957:31-2) -only a few sites of the early Atlantic are coastal; such as Vedbaek, associated with red and roe deer, boar, grey and ringed seals, porpoise, cod, haddock, and *no* shellfish (Troels-Smith 1966/7:522; Waterbolk 1968:1096)
Ertebølle	-also called kitchen midden culture, *kjøkkenmøeddinger*

Table IV Continued

Cultural Designation or place	Description
Ertebølle	-in certain places marked by the incursion of pottery and other Neolithic elements (Bray and Trump 1970:81-2) -derived from Childe's hypothetical coastal culture of the Maglemosean (the Kongemose?)(Childe 1958:32) -Ertebølle as still a forest adaptation; year-round occupation, but with use of marine and littoral resources, especially oyster banks (Childe 1931:336) -used year round on the basis of faunal elements present (Clark 1936:140) -two kinds of Ertebølle: the shell middens such as Ertebølle itself, and plain coastal sites such as Dyrholmen (Brinch-Petersen 1973:96) -some seasonal such as Ølby Lyng (Brinch-Petersen 1973:97) -no coastal station with exclusively a marine fauna recorded in Denmark (Brinch-Petersen 1973:96-7) -trapezes as almost sole microlith, burins common (Brinch-Petersen 1973:142, 145, 152) -*petit tranchant* arrowheads numerous (Brinch-Petersen 1973:142) -flint industry more Upper Palaeolithic than Maglemosean (Clark 1950:96) -as Epi-Mesolithic (Clark 1946:19) -as late in Gabel's (1958a:659) system -dated as Atlantic (Clark 1952:37) -pottery in form of jars with pointed bases and smoothly everted rims, also shallow oval vessels felt to represent lamps (Clark 1975:160) -Clark calls it a coastal and specifically shell midden or kitchen midden culture (Clark 1975:160) -equipment from Ertebølle sites on the Littorina shore only represent one phase of Atlantic settlement (Clark 1975:160)

Table IV Continued

Cultural Designation or place	Description
Ertebølle	-continuation of Maglemosean with a coastal emphasis (Gabel 1958a:660) -Moberg calls it early coastal along with Kongemose (Moberg 1962:310) -Abbott reports these conditions for Castle Hill; a kitchen midden with pottery and some animal domesticates, but probably a high reliance still on wild forms, shellfish collecting and fishing (Abbott 1895a: 123-6) -Westward Ho! shell (mollusc) midden with rodents, hedgehog, fallow deer, red deer, boar, pig (domesticate?)(Churchill and Wymer 1965:77) -some evidence of animal domestication in Danish sites (Troels-Smith 1966/7:522-3) -variation in shell content in some sites; *Ostrea edulis* and *Cardium edule* in Westward Ho! midden; *Patella vulgata* and *Littorina* species at Blashenwell, Culverwell and Portland I (Jacobi 1973:250)
Netherlands	-sites on well drained sandy soils, little organic material preserved (Price *et al.* 1974:8) -occupation of Havelte de Doeze in early half of Boreal (Price *et al*. 974:58) -Tjongerian as part of widespread *Federmesser* tradition (Waterbolk 1968:1094) -*Federmesser* as 'pen-knife'culture (Schwabedissen 1962:255) includes Azilian, Creswellian; may represent an adaptation by Magdalenian reindeer hunters to forest conditions (Schild 1976: 91; Waterbolk 1968:1094) -Schwabedissen felt that *Federmesser* represented a wave of colonization from a Magdalenian centre in southern Germany; this idea is not supported by palaeoenvironmental data which aligns this culture with the first appearance of Boreal forests (Schild 1976:93)

Table IV Continued

Cultural Designation or place	Description
Netherlands	-de Leien-Wartena culture in northern Netherlands, and in northwest part of German Federal Republic (Kozlowski 1973a:341)
Central Europe	-Poland: Tarnovian as part of *Federmesser* (Schild 1976:91) -Czechoslovakia: assigned to the French categories, described as a broad spectrum adaptation (Neustúpny and Neustúpny 1961: 35-6); associated at Sered I with red and roe deer, boar, *Bison* sp., *Bos* sp., *Equus* sp., and *Lepus* sp. (Barta 1973:62) -Świderian as non-geometric microlith industry found between the Oder and Volga/ Oka Rivers (Childe 1958:26; Gimbutas 1956: 27); type site as Swidry Wielkie, Poland, twenty miles south of Warsaw (Gimbutas 1856:27) -Swiderian as the Maglemosean of northern Poland, forest adapted (Jazdzewski 1965: 24-5; Childe 1958:26) -Boreal here as Tardenoisian (Jazdewski 1965:50) -Chwalibogwicien represented in open air dunes in Poland (Kozlowski 1926:52); Tardenoisian assemblages here as well (Kozlowski 1926:57)
European Russia	-Chernysh feels that upper two levels at Molodova V are Mesolithic; if so, then they represent a gradual transition from the Upper Palaeolithic (Ivanova 1964:319) -mammalian fauna similar to latter, except for disappearance of mammoth; reindeer still important (Ivanova 1964:320) -Molodova V Mesolithic seen to parallel the Azilian, an Upper Palaeolithic derived tradition (Ivanova and Chernysh 1965:211-3) -Voevodskii in 1950 used the terms Shan-Koba and Murzak-Koba to describe Azilian

Table IV Continued

Cultural Designation or place	Description
European Russia	and Tardenoisian here (Gimbutas 1956:14) -Shan-Koba lithics as Upper Palaeolithic derived; associated with a variety of Pleistocene forms and temperate ones: bison, saiga antelope, stag , boar, horse, wild ass, wolf, dog, fox, badger, lynx, hare, marten (Gimbutas 1956:16) and reindeer (Sulimirski 1979:35) -Murzak-Koba as a Pontic Tardenoisian with domesticated dog, presence of boar, red deer and Helix vulgaris (Gimbutas 1956:16) -also a Pontic sub-Neolithic, similar to Danish kitchen middens, containing fresh water shells, fish and animal bones; in the Dniepr rapids (Gimbutas 1956:17)
South-eastern Europe	-Yugoslavian Mesolithic assigned to Azilian and Tardenoisian; no woodworking tools present (Alexander 1972:27) -Mesolithic sites in southeastern Europe located along river banks and lakes, on sand dunes and mountain foothills (Tringham 1971:35) -intensive exploitation of certain species especially red deer, boar and river fish (Tringham 1973:558) -evidence of a pre-pottery Neolithic (Tringham 1973:553)
Lepenski Vir	-at end of upper gorge of the Iron Gates, accessible solely by water (Sréjovic 1969:26) -marks the shattering of Upper Palaeolithic continuity in this area (Sréjovic 1972:14) -cultually Neolithic, but without a Neolithic subsistence base -fauna at the sites includes the domesticated dog, also aurochs, red and roe deer, boar, marten, badger, beaver, birds, cyprine fish, catfish, other fish (Bokonyi in Sréjovic 1972:187)

Table IV Continued

Cultural Designation or place	Description
Lepenski Vir	-distinctive trapeziform houses with hard red-lime plaster floors, stone sculptures in phase I; without hard floors in phase II (Bokonyi 1970:1702)
Greece	-trapezes here at Nea Nikomedeia with Neolithic rather than with Mesolithic as in western Europe (Dakaris et al. 1964:207) -Asprochaliko: geometric assemblage found with inferred seasonal occupation (Higgs and Vita-Finzi 1966:10,12,27) -Franchthi cave: heavy Mesolithic reliance on red deer, secondarily on Vulpes sp., boar (Jacobsen 1969a:352) -fish remains decrease in volume and number from top to bottom in the sequence (Jacobsen 1969a:352,1973a:59) -presence of a true Aceramic or pre-pottery Neolithic yet to be demonstrated (Jacobsen 1974:303) -if present, is marked by a sudden introduction of sheep/goat, representing the dominant Neolithic species (Jacobsen 1969:8-9, 1973a:66)
Romanellian	-found in Italy and Mediterranean France; felt to be Upper Palaeolithic (Rozoy 1971:370), possibly on the same lines as the Cantabrian, as a temperate adaptation -also called Grimaldian in the western Mediterranean (Waterbolk 1968:1094) -transition between Upper Palaeolithic and Mesolithic not clear in the Mediterranean zone (Escalon de Fonton 1974:66) -marked at the Grotta della Madonna a Praia a Mare, Calabria, Italy by change in mollusc utilization from Helix ligata, a terresntrial mountain species now found only above 400 m. elevation to marine

Table IV Continued

Cultural Designation or place	Description
Romanellian	species (Durante and Settepassi 1972:268) -large and small game, land and marine shells; found in cave sites (Waterbolk 1968:1094) -felt to be earliest use of marine shells (Waterbolk 1968:1094)
Asturian	-found in caves and rock shelters along the coast of the eastern half of Asturias (Oviedo), Spain (Gabel 1958a:664) -shell middens sometimes found over Azilian levels, contain few artifacts other than the quartzite picks to which the name Asturian was given by Conde Velga del Sella (Savory 1968:48; Obermaier 1924:349; Gabel 1958a:664) -process of generalized adaptation and trend to microliths began here long before the Holocene (Savory 1968:44) -specialized cold fauna of the Pleistocene limited in distribution south of the Pyrenees (Savory 1968:44) -Azilian appears here stratified above Magdalenian in the caves of La Paloma, Soto de las Regueras and Santimamine (Savory 1968:48) -Asturian more widely distributed than Azilian (Savory 1968:48) -chronologically overlaps with the Neolithic (Gabel 1958a:664) -as developed Tardenoisian and proto-Neolithic for Obermaier (1924:323,349); as late in Gabel's sequence (Gabel 1958a:659) -in caves 8-10 km. from present sea coast (Ferrier 1950:74) -present with limpets,topshells, cockles, red and roe deer, horse, aurochs, boar, Pyrenean ibex, chamois, weasel, otter, wolf, wild cat, badger, hare, with red deer as most important element (Obermaier 1924:350; Clark 1971:1246)

Table IV Continued

Cultural Designation or place	Description
Asturian	-Asturian over Azilian at La Riera, Balmori (Clark 1971:1246) -Asturian *concheros* could have represented year-round occupations since molluscs here are not subject to poisoning of coastal niches in summer (Clark 1971:1255)
Portugal	-shell middens of Muge in the Tagus River valley -Portuguese Capsian, according to Gabel (1958a:659) -absence of pottery, domesticates other than dogs (Burkitt 1925:150) -accumulated at a time when sea levels were higher than at present (Gabel 1958a:663) -Roche feels these were occupied at a time when water temperatures were warmer than present, i.e. Atlantic times (Roche 1965:161) -water salinity greater than present as well (Roche 1972b:85) -terrestrial and marine shells, remains of red and roe deer, boar, *Vulpes vulgaris*, *Meles taxus*, *Lutra vulgaris*, *Felix pardina*, *Bos primigenius* (Roche 1972b:85), horse (Savory 1968:81) -most recent site, Cabeço da Arruda occupied immediately prior to Neolithic (Roche 1965:161)
Natufian	-found in Israel; named after the Wady-el-Natuf at Shukba (Garrod 1932:261, 1957:211-2) -on borderline of hunter/gatherer and farming economies; lithics belong to Mesolithic tradition (Hawkes 1963:93) -called pre-, proto-Neolithic, also Mesolithic, Neolithic (Braidwood and Howe 1960:155) -appears 11,000 B.P. with equipment for grain management (sickles, grindstones)

Table IV Continued

Cultural Designation or place	Description
Natufian	(Butzer 1971:541;Hawkes 1963:93) -fishers; no fish in sites, but fishing gear (Childe 1934:39; Garrod 1932:216) -open air and cave sites (Clark 1962:103-4) -hunters, especially of gazelle, also fallow and red deer, boar (Garrod 1932:216) -no domesticated dog in the Natufian of el-Wad (Butzer 1971:556)
Zarzian	-open air and cave sites centred in Iraq (Braidwood and Howe 1960:156) -terminal aspect of food collecting era; type site of Zarzi with geometric microliths, diminuative blade industry (Garrod 1930:15; Braidwood and Howe 1960:155) -Ishkaft Palegawra in a cool dry Artemisia steppe, with a variety of steppe and forest fauna (Turnbull and Reed 1974:86,92-5) -latest cave horizon in Iraqi Kurdistan (Braidwood and Howe 1960:156)
Iberomaurusian	-named by Pallary in 1909 to suggest relationship with Spain; called Oranian by Vaufrey (Alimen 1957:52) -La Mouillah as type site (Alimen 1957: 52; Hugot 1970:29) -littoral facies of Upper Palaeolithic and Mesolithic in the Maghreb (Bellin 1954:429) -began to spread widely in northwest Africa around 15,000 B.C. (Clark 1970:159) -appears suddenly in Cyrenaica according to MacBurney and in the Maghreb (Clark 1970; Macburney 1967) -specialized and restricted use of snails, molluscs (Childe 1934:39; CLark 1970:172) -oldest Epipalaeolithic industry (Camps and Camps-Fabrer 1972:20) -usually located in caves, enclosed in deposits full of ashes (Alimen 1957:52)

Table IV Continued

Cultural Designation or place	Description
Iberomaurusian	-mainly in coastal Morocco and Algeria -backed bladelet industry, notched bladelets, endscrapers but few microliths (Hugot 1970:29)
Capsian	-located in high plateaus of Tunisia and nearby Algeria; first described by J. de Morgan at El Mekta near Gafsa (Alimen 1957:52,60) -no relation to the Iberomaurusian in terms of lithics (Butzer 1971:586); but still a blade/bladelet industry (Hugot 1970:30) -preceded temporally but not spatially by the Iberomaurusian (Lubell *et al*. 1976: 910) -succeeds Iberomaurusian at some sites (Clark 1970:160) -two major types: typical Capsian with many backed blades and bladelets, also angle burins, notched blades, endscrapers and geometric microliths (Hugot 1970:30); also *Capsian supérieur*, similar to typical, with higher frequency of backed blades than bladelets, and more variety in the geometric microliths (Hugot 1970:30) -found in *rammadiya* or *escargotières* rich in implements, with a number of animal bones, and hearths formed of large stones placed closely together (Alimen 1957:51) -use of terrestrial snails (*Helix* sp., *Rumina decollata*)(Butzer 1971:585) -intensive collectors (Butzer 1971:586) -sites never less than 70 km. from the coast (Butzer 1971:586) -Gobert argued that snails were not necessarily the most important dietary item (in Lubell *et al*. 1976:910) -as early in Gabel's (1958a:659) sequence; as Upper Palaeolithic/Epipalaeolithic in Obermaier (1924:323) -Capsian as providing method of analysis with the Iberomaurusian for Mesolithic assemblages

Table IV Continued

Cultural Designation or place	Description
Capsian	elsewhere (cf. Tixier 1963)
Neolithic of Capsian Tradition	-an industry of Capsian affinities with the addition of pottery of non-Saharan type; polished stone and worked bone (Hugot 1970:31) -also ostrich shell and arrowheads (Butzer 1971:586) -represents the grafting of Neolithic patterns on to a long standing tradition (Butzer 1971:586) -Neolithic since polished stone implements and pottery present, Capsian as a result of flaked stone elements (Gillman 1974:273) -succeeds Upper Capsian in the classic Capsian area (Gillman 1974:273) -second facies in Maghreb, called a Mediterranean Neolithic, with a western and coastal distribution may only be an artifact of site distribution (Gillman 1974:274) -Neolithic of Capsian Tradition in Mediterranean steppe area with more than 400 mm. rainfall annually; Mediterranean facies with more than this (Gillman 1974: 274) -as late in Gabel's (1958a:659) sequence
Nubian Nile Valley	-Sebilian as long standing cultural continuum (c. 15,000-9000 B.C.), based on a continuing Middle Palaeolithic tradition which evolved into a geometric microlith industry (Clark 1970: 169; Smith 1966:336; Marks 1968b:469) -discovered by Vignard at Kom Ombo, Egypt; of limited distribution, riverine adapted (Alimen 1957:97; Butzer 1971:587, 590; Phillips 1973:98; Marks 1968b:461) -emphasis on faceted platforms flakes mainly produced from flat unifacial Mousterian discoidal cores (Marks 1968b:475)

Table IV Continued

Cultural Designation or place	Description
Nubian Nile Valley	-Halfan and Qadan (c. 12,500-4500 B.C.), microlith industries on radially prepared flakes and blades (Clark 1970:169); similar to Natufian in economic orientation (Stigler 1975:131) -stage IV of Halfan sequence dated in Nubia 17-16,000 B.C. (Marks 1968a:400) -Halfan totally unrelated to Sebilian (Marks 1968a:457) -fully microlithic (Marks 1968a:457) -Sisilian as microlithic, using microburin technique (Clark 1970:169; Smith 1966:336,343)~~,~~ reminiscent of Iberomaurusian -Sebekian as using longer blades, no microburin technique (Clark 1970:169) -these two latter as circum-Mediterranean Mesolithic (Smith 1966:343) -reliance on hunting of antelope, gazelle, hippopotamus, also fishing (Smith 1966:338) -increasing emphasis throughout sequence on cereal grains (Clark 1970:169-170) -Kom Ombo possibly occupied year-round by at least part of the population in Late Palaeolithic times (Churcher and Smith 1972:261)

Chapter V

A Human Ecological Hypothesis for Early Postglacial European Prehistory

> Here I was only discovering for myself, in the practice of historical research, principles which Bacon and Descartes had stated, three hundred years earlier, in connection with the natural sciences. Each of them had said very plainly that knowledge comes only by answering questions, and that these questions must be the right questions, and asked in the right order... The historian has to decide exactly what it is that he wants to know; and if there is no authority to tell him, as in fact (one learns in time) there never is, he has to find a piece of land or something that has got the answer hidden in it, and get the answer out by fair means or foul (Collingwood 1939:25,81).

The standard model for the Mesolithic is an economic and technological one composed of two stages. The first is aligned with the Preboreal and Boreal phases, the second with the Atlantic. This division owes its origins in the archaeological sphere to Hugo Obermaier who postulated the existence of an Epipalaeolithic, distinct from later 'proto-Neolithic' developments. The former was established to encompass cultural manifestations such as the Capsian, Tardenoisian, Azilian and Maglemosean, which he saw as "posthumous descendants of the Palaeolithic, on which account we have adopted for the group the name of Epipalaeolithic" (Obermaier 1924:323). He saw these cultures as distinct from developments such as the Asturian, Campignian and the *kjøkkenmøeddinger*, which "show no organic relation to the preceding ones, but introduce a new and essentially distinct civilization which we have termed the 'proto-Neolithic'"(Obermaier 1924:323).

This model was elaborated by Creighton Gabel in an interesting analysis of early postglacial societies (Gabel 1958a).

> Among the Mesolithic cultures so far recognized, one of the clearest and most significant demarcations is between early hunters and fishermen living primarily in the interior during the Boreal, and later strand-loopers of the Atlantic or Litorina[sic] horizon with a way of life geared towards a coastal economy. Although one must admit the possibility of coastal occupations during the Boreal or even the late Pleistocene (most traces of which would have been erased by rising sea levels), this does not discount the maritime nature of many late Mesolithic cultures (Gabel 1958a:659).

Such a model implies that radical if not revolutionary changes in economic orientation took place at the Boreal/Atlantic intersect. The prime mover behind this phenomenon was felt to exist in the natural world, a view ehich equates well with the model of the directive of Mesolithic research towards environmental explanations. Gabel himself reported that climatic amelioration or changes in shorelines, both inferred for this time, made coastal settlement more attractive (Gabel 1958a:659).

To what extent can environmental change at this time be held responsible for an inferred population shift? Even the proposed movement is not well documented. If the Holocene is characterized by gradual transitions from one biogeographical situation to another, then why would this change necessarily result in the widespread migration inferred for this particular time?

Waterbolk argues that the Atlantic forest would have effectively prevented continued habitation of the interior (Waterbolk 1968:1096), but gives no reasons for this statement. However, Stanley

Czarnick sees these supposed widespread population shifts as only the result of differential preservation of sites.

> With the postglacial period came the active downcutting of many European rivers and streams resulting in alluvial fills under which many early Mesolithic riverine settlements are lost and buried. Most Mesolithic open air sites lacked the depositional medium of loess that covered and preserved so many Palaeolithic sites during the glacial period (Butzer 1971:536). Thus, any Palaeolithic-Mesolithic differential in "centers of population growth" may be more an artifact of the archaeological record than it is a reflection of actual post-Pleistocene migrations or population reductions (Czarnick 1976:64).

While this statement refers particularly to early post-Pleistocene conditions, it might be equally applicable to later ones. The difference in site numbers and distributions between the late Pleistocene and early Holocene may be the result of natural occurrences, or they might reflect an increasing importance of seasonal usage of certain areas over time. Increasingly warm and moist climatic conditions which heralded the onset of the Atlantic may have selected against some of the large Holocene herbivores in much the same way as increasing warmth in the early Holocene resulted in the breakdown of the steppe/tundra fauna of the late Würm.

The general Mesolithic model is interpreted here in the following ways. The 'Boreal' type, labelled Mesolithic A for convenience only, was an Upper Palaeolithic rapprochement to an increasingly closed temperate forest. It was oriented to the land, especially to riverine and riparian microenvironments, and food gathering activities of the time centred on hunting, fishing and collecting.

It was a revised Palaeolithic tradition, but enough like its predecessors to have been labelled Epipalaeolithic. This relationship was recognized by Abbé Breuil in his establishment of a Leptolithic which subsumed all cultural traditions from the Aurignacian through the Mesolithic (cf. Ferrier 1950:67). In terms of Table IV, it includes the Azilian, Arisian (if in fact this exists at all), Arudian, Early Larnian, Maglemose, Kongemose, Sauveterrian and Tardenoisian, Federmesser, Shan-Koba, Murzak-Koba, and the adaptations described for Lepenski Vir and Franchthi Cave.

The Atlantic Mesolithic, type B, is characterized by coastal settlements and the presence of true marine shell kitchen middens, which imply a coastal economic orientation. This orientation was in addition to use of terrestrial resources characteristic of the Boreal Mesolithic form. Representative types would be the Asturian, Late Larnian, Obanian, Portuguese Tagus sites, Ertebølle, the Kongemose site of Brovst, Zealand (cf. Brinch-Petersen 1973:96), the Pontic sub-Neolithic, and the Breton Tardenoisian.

The degree of difference between thse two forms has not been established. Growth of coastal settlement and increasing use of resources from this zone took place in addition to interior activities, and did not serve to replace them (Clark 1967:100-3). Almost forty years ago, a philologist and a prehistorian, examining the Scandinavian sites, felt that the subsistence patterns of kitchen midden inhabitants paralleled those of the Maglemoseans, even though the natural conditions may have differed (Shetelig and Falk 1937:36).

It is argued here that the division presented in the commonly accepted model is too simplified to take account of the wide variety of adaptations normally labelled Mesolithic only because they were assignable to the early postglacial. Despite Waterbolk, there seems to be no reason _per se_ why Atlantic conditions would have prohibited man from living in the interior of the northern European plain. Rather than this restriction, the creation of the Littorina Sea opened up a new set of economic choices that were available to Baltic peoples. This then was a fundamental addition to an adaptive strategy, rather than a replacement.

It has formerly been seen as surprising that there was a high reliance on marine or riverine resources, especially fish, during the early postglacial. Richard Lee on the other hand states that ethnographic research implies an expected high reliance on fishing as the dominant mode of subsistence in areas located 40° to 59° north or south of the Equator (Lee 1968:42). Societies in these latitudes exist in cool to cold temperate climates, and fishing was the primary means of adaptation in 14 out of 22 documented cases (Lee 1968:42; cf. Table V). A fishing adaptation should therefore be the norm for this area rather than the exception (Woodman 1973/4: 14). Fishing was an extremely important activity in the classic Mesolithic area of the early postglacial, which might be stated as corresponding to the 50°-59° demarcation, and formed a staple of the diet in the sector from 40° to 49° as well. The Mesolithic orientation towards maritime areas in addition to inland ones can perhaps be explained by reference to this table. In the zone from

Table V

Latitudinal Distributions of Hunter/Gatherer Subsistence Patterns (Lee 1968:43)

Degrees from Equator	Major Subsistence Pattern (figures represent number of societies included)			
	Gatherer	Hunter	Fisher	Total
over 60°	-	6	2	8
50-59°	-	1	9	10
40-49°	4	3	5	12
30-39°	9	-	-	9
20-29°	7	-	1	8
10-19°	5	-	1	6
0-9°	4	1	-	5
Total	29	11	18	58

10^o to 50^o, gathering is a major subsistence pattern. It is in these areas that the first domestication of plants and animals took place, not in the Mesolithic sector.

The status of the division between the two basic Mesolithic types is questionable precisely on the economic grounds by which it was first formulated. The sites, according to this model, suggest a bimodal resource distribution, type A without marine molluscs, type B with them. In addition to this distinction, the molluscan fauna in type B sites may mask their true nature and instead create a false impression of the importance of shellfish in the diet. This situation has already been postulated for the terrestrial snail mounds or escargotières found in Algeria and Tunisia (cf. Gobert in Lubell et. al. 1976:910) and effectively demonstrated (Lubell et. al. 1976).

A case closer to the Danish kitchen middens was presented by W. Shawcross for a New Zealand site (Shawcross 1967). He analyzed the proportional calorific importance of a variety of faunal forms in this site. On analogy with his figures, Grahame Clark has estimated that an average Ertebølle midden would have accounted for 6.6% to 21% of the diet in a 120-day occupation period for a three-family group, and 5% to 16% for a four-family one (Clark 1975:194).

> On the analogy of the New Zealand middens we arrive at the conclusion, whichever end of the range we care to adopt, that shell-fish played only a subsidiary role even at the time of year when people were settled within range of the shell-mounds. As in so much traditional prehistory, terminology and the body of ideas associated with this rests on the accident that a particular category of site happens to be visually prominent (Clark 1975:194).

One other source of economic information lies in the animals present in Mesolithic middens. Faunal lists are not included in this study, since they will not assist in the analysis. When independently examined, presence/absence tables revealed a pattern that aligned itself closely with charts recently presented by M.R. Jarman (Jarman 1972:141-7), but solely in reference to species present. Problems relating to the requirements of individual mammalian species are being attacked by both Leslie Freeman (1973) and Geoffrey Clark (1971). These, when produced and overlapped for a specific site, will give an idea of the range from which resources were obtained, similar to the notion of a site catchment basin: "the total area from which the contents of a site have been derived" (Higgs and Jarman 1975:ix).

Little is presented in archaeological literature concerning the requirements of molluscs found in kitchen middens (but cf. Clark 1971:1250-5). It is apparent that species represented in some sites differ markedly from those in contemporary ones elsewhere. For example, at Westward Ho!, the midden was formed of cockle (Cardium edule) and oyster (Ostrea edulis) remains; at Blashenwell, Culverwell and Portland I, of limpets (Patella vulgata) and winkles (Littorina sp.)(Jacobi 1973:250). The Littorina sp. are reported as cold-water adapted forms (Clark 1971:1251), but little is presented about the ecological parameters of the others. The Westward Ho! midden is dated to 6585±130 B.P. (Q-672)(Radiocarbon 6:126), Blashenwell to 6450±150 B.P. (BM-89)(Radiocarbon 3:40), and Culverwell to 7150±135 B.P. (BM-473)(Radiocarbon 13(3):169). These differences could possibly be interpreted as the result of local environmental conditions or as demarcations of changing cultural preferences, but only if the ecological parameters are worked out (cf. Durante and Settepassi 1972 for an example of this kind of analysis).

E.S. Higgs and C. Vita-Finzi have recognized a fundamental problem which is characteristic of an economic or ecological approach to prehistory.

> But it is not enough to shift the emphasis to economy; new techniques are required to ensure that the information latent in the archaeological record is made available for analysis (Higgs and Vita-Finzi 1972:27).

One must examine the criteria used to define distinct archaeological levels, and, by implication, separate prehistoric societal units. Having done this, it becomes apparent that any model designed for use in Mesolithic research must imply some sort of generalized adaptation to a changing environment as its basic premise. It is an understatement to argue that "up to a certain point the cultural apparatus is sufficiently flexible to cope with environmental change" (Clark in Newell 1973:412).

The Mesolithic is more than a temperate forest adaptation making use of a broad range of natural and human resources, since it encompasses the Preboreal as well as the Boreal and Atlantic. But the demonstrable choice of a number of resources mitigates against the reliance on any one, which in a give year might be absent. Diversification of resource base is seen as a fundamental economic requirement for prosperity, even for developing nations today.

There should be no division of sites (or, in turn, cultural designations above the site) into 'coastal-adapted' and 'inland-adapted' forms. Such a division implies a fundamental dichotomy that the evidence just does not bear out. For example, a new series of habitation levels from caves discovered in the Marseille area,

> ...have clearly indicated that coastal exploitation was an integral and functional element in the total Mesolithic economy (adaptive strategy) from its earliest stages to and including the first contacts with food-producing peoples, and was not a function of climatic oscillations ...In those areas where geologic and hydrographic conditions have fortuitously conserved coastal sites, and these have been discovered and excavated, we find a continous series of coastal sites, complementing the inland sites, from Late Glacial and early Post Glacial into the mid Atlantic (Mediterranean coast, Norwegian and Finnish coasts). In those areas where coastal adaptation is not recorded, we find that the potential settlement areas are now submerged or have been covered by thick marine deposits before the retreat of the sea and/or lifting as a result of isostatic rebound. In those areas where coastal settlement is apparently restricted to a small segment of the archaeological record (Portugal, N. Spain, Brittany, S.E. England, Denmark), we find that the segment is directly correlated with the presence and accessibility of the appropriate littoral sediments (Newell 1973:410-412).

The Mesolithic was never finely divided into two types. It was usually realized that these distinctions were solely of degree rather than kind, and served mainly as heuristic devices. But general conceptions of prehistory still follow Waterbolk's (1968) model of a major environmental and population shift in late Boreal times which emphasized coastal settlement and coastal resource utilization. One does not necessarily follow from the other. The Kongemose was characterized by coastal settlement, but not by an adaptation to marine resources. It was more of a coastal Maglemosean, 'coastal' only as a result of geographical location. A seasonality model does not appear to explain this peculiar adaptation; nothing is revealed in the faunal complement which would argue for differences in adaptation. It is perhaps too soon to argue any model which relies on the Kongemose as a baseline; the nature of thess sites is still being defined (cf. Brinch-Petersen 1973). However, the standard model of the Mesolithic is too restrictive. It eliminates the study of cultural variability which Brinch-Petersen has reintroduced to northern European research.

A general model with few parameters might be of more use. Such a model implies that the Mesolithic is a postglacial phenomenon; therefore it must be restricted to locales which experienced glaciation. It also exhibits some characteristics of settling into local conditions, such as those which form Caldwell's trend to a primary forest efficiency (Caldwell 1962:288). The features described by Price can also form part of this definition-"low population density, ephemeral settlement, small group size, and dependenc upon a wide range of subsistence resources" (Price 1973:471).

Such an adaptation may be marked in certain resource abundant locales by an increased importance of maritime and littoral fauna in the diet (such as the coastline area of the Littorina Sea, Northern Ireland and Scotland, the Asturian region of Spain, and so on). But this new factor did not result in a completely changed form of adaptation. It is grafted on to a basic Mesolithic pattern in much the same way that Neolithic elements are eventually added. By this definition, a Mesolithic adaptation becomes Neolithic when a higher reliance of subsistence is placed on classic agricultural products such as cereals, than on wild forms. It is difficult to draw the line as an absolute since it is arguable that particular species may have been 'managed' centuries before genetic changes took place which would serve to separate 'wild' from 'domesticate' forms on morphological grounds (cf. Higgs and Jarman 1972:7,12). Features such as pottery are Neolithic attributes, but do not mark Neolithic subsistence, as in the case of some Ertebølle sites.

The description of a Mesolithic adaptation presented here is not the same as Flannery's perception of a broad spectrum utilization of resources (Flannery 1969:77). The latter implies experimentation with the natural world which eventually produced domestication. Such a pattern is not observed in the temperate forest of Europe.

The question remains as to what should be subsumed under the category of Mesolithic. Near Eastern and North African sites do not fit under the narrow definition which implies glaciation, but may in turn be relevant for the study of a generalized hunter/gatherer economic adaptation which forms part of the concept itself. In addition, these were possibly influenced in some way by periglacial and climatic changes which extended disturbances southwards beyond the steppe/tundra zone (cf. van Zeist 1969). This problem will be examined in the next chapter.

Given this definition, it might be argued, as Spaulding once did, that there is a broad homogeneity of cultural adaptation in the boreal or deciduous forests of the entire Northern Hemisphere (Spaulding 1942:143,151). The Eastern Archaic, formulated by William

Ritchie for the New York State Lamokan tradition (Willey and Phillips 1958:104), could be therefore easily perceived as a Mesolithic. It has since been redefined as "the stage of migratory hunting and gathering cultuers continuing into environmental conditions approximating those of the present" (Willey and Phillips 1958:107), and, more recently, as "a fundamental lifeway not geared to any one ecosystem" (Jennings 1968:111). It is supposedly marked by an increased dependence on small, perhaps more varied game, a foraging pattern of existence (Willey and Phillips 1968:107; Jennings 1968: 110). In a long sequence found at Danger Cave in the American Great Basin, a variant of the Archaic, labelled the Desert Archaic, was first discovered (cf. Jennings 1957).

It is not accepted here that the North American Archaic represents only a stage of early gathering societies, but rather one marking a generalized hunter/gatherer adaptation (Willey and Phillips 1958:106-7). Additional elements were grafted on to the Archaic base (pottery, burial mounds) in much the same way that similar features were added to the European Mesolithic. Incorporation of these elements into the Eastern Archaic is seen as not creating any changes of significance from a 'developmental' point of view (Willey and Phillips 1958:118).

> Our hypothesis starts with the assumption that the basic adaptation to the modern forest and waterside environments is represented by the various Archaic cultures already considered and that their ultimate sources lie in the boreal cultures of the Eurasian Mesolithic and Neolithic stages (Willey and Phillips 1958:118).

Unlike Willey and Phillips, it is not argued here that the North American Archaic has its origins in the Old World Mesolithic, but rather that both are similar, if not identical responses to comparative environmental conditions of the early psotglacial in the Northern Hemisphere.

The existence of microlithic elements in an assemblage should not be used as the sole indicator of the existence of a Mesolithic site. It has already been shown that these are not found only in Mesolithic assemblages, and non-microlithic traditions such as the Larnian and the Asturian are generally considered Mesolithic anyway. What is being presented here is a model which relies solely on environmental and economic attributes, and exists above but not separate from technological traits.

It has been the strength of the Mesolithic as a concept to centre on economic variables, as well as on general, not specific, modes of adaptation.

> As there would be a lack of strongly contrasting ecological zones there would also be less reason for specialized hunting sites in the Mesoilthic. The available evidence would suggest that the way of life practiced in Northern Europe during the Mesolithic was such that there would have been only a very slight tendancy to develop strongly specialized sites (Woodman 1973/4:5).

The model presented here would separate the Mesolithic only in a minor way from particular kinds of Upper Palaeolithic adaptations. The divisions here would be the commonly accepted ones. The former is Holocene in date, the latter Pleistocene. The Mesolithic is an adaptation to changing conditions of the early Holocene, and perhaps marks an increasing importance of seasonality as a subsistence pattern. The classic late Upper Palaeolithic cultures, subsumed under the term Magdalenian, are adaptations to the steppe/tundra of a periglacial Europe and represent a lifestyle attuned to the herbivores and other resources of this area. These two 'stages' are easily distinguished. Upper Palaeolithic sites in Mediterranean Europe, on the other hand, are not considered in this division. Most could be called Epipalaeolithic, and probably reveal long traditions of essentially Mesolithic adaptations datable to the Pleistocene.

Similarly, the division between the Mesolithic and the Neolithic is often solely an heuristic construct. In sites with superimposed levels, the transition from one to the other is usually gradual, and divisions are made on the presence of typologically Neolithic attributes such as particular kinds of true arrowheads, pottery, and polished stone tool implements. These standards of distinguishing the two must perforce remain in usage until the nature of the Mesolithic/Neolithic transition is better known in these, and other areas.

The Mesolithic has historically served as a residual category (Czarnick 1976:60), encompassing a wide range of economic and technological traditions. The hypothesis presented here emphasizes the broad range of economic responses as the key to the proper comprehension of the early postglacial societies subsumed under this category.

Chapter VI

The Case for Non-European Mesolithic Traditions

> Certainly a much abused term as 'Mesolithic' should not be lightly introduced into this part of Africa if it is based simply on the presence or even proliferation of microlithic tools, geometrics, etc., or the assumed presence of composite tools; by such criteria the Magdalenian II of France would also be 'Mesolithic' (Smith 1966:348).

In the last chapter technological criteria were de-emphasized in an attempt to explain the variety of postglacial adaptations visible in the archaeological record. It has been established that economic grounds have always been more important for the definition than technological ones, and that this was the proper approach to take. But the nature of environmental change and cultural responses to it are not yet clear.

> I consider it incorrect to accept as definitely proved the assumption that every variation in environment was immediately reflected in the method by which man made his tools (Althin 1954:145).

It is accpeted that adaptations to the natural world vary directly with the nature of the environment concerned. Whether or not these adaptations can be seen in lithic assemblages remains to be seen, and is not the real problem at all. Lithic technology does not form the basis of the Mesolithic concept as described here; it in fact exists as a separate variable in the archaeological record, useful only for arguments which can be made concerning function and therefore behaviour. In this way the statement made above by Smith (1966:348) is rendered invalid, given the new means of reoperationalizing the Mesolithic concept.

The definiton of the Mesolithic as a postglacial 'readaptation' implies a major factor which induced as systemic imbalance in the first case. Glacial phenonena are seen as providing this disequilibrium.

> The term Mesolithic, justified in certain areas such as Western Europe by the occurrence of similar assemblages of microlithic flints in strata intermediate between the normal palaeolithic and the normal neolithic or copper age, must be used with caution. It must not be assumed that because some industries in North Africa, Palestine, or Kenya are designated Mesolithic they are really any older than advanced cultures, neolithic or even metal-using, in Egypt or Mesopotamia (Childe 1934:34).

It is difficult to say whether or not this new, or in fact any, Mesolithic hypothesis should be applied outside of continental Europe. But if the definition includes the Mediterranean coast of Europe, as it presumes to do, then it also should be able to account for certain similar Near Eastern and North African tradiitons. In the circum-Mediterranean basin, as in Cantabria, Mesolithic adaptations exist which can easily be labelled Upper Palaeolithic or Epipalaeolithic. The division between the Mesolithic and the Upper Palaeolithic in these areas is made basically on technological and temporal grounds, and serves mainly as an heuristic device. Philip Smith is correct to argue that no typological definition of the Mesolithic can hold for northeastern Africa; as elsewhere such a term must rely to its greatest extent on environmental rather than cultural data.

Creighton Gabel properly argues that the Mesolithic is marked by cultural features in addition to the ubiquitous microliths (Gabel

1958a:658), but the general adaptation hypothesis presented here should function to link all of these disparate features together. Therefore the Zarzian, Natufian, Iberomaurusian, Capsian and the Neolithic of Capsian Tradition, as well as other contemporary traditions can be included in the Mesolithic concept, but must not serve to define it. The border which exists to separate the Mesolithic from the Neolithic, like elsewhere, is not clearly marked in Europe by cultural or econmic phenomena. In one instance it may be possible to trace the rate of movement of agricultural peoples from the east and southeast into temperate Europe by means of the archaeological record (cf. Ammerman and Cavalli-Sforza 1971, 1973; Cavalli-Sforza 1974). But in many instances the division between the two is arbitrary, made on the appearance of a particular fossile directeur: true arrowheads, polished stone implements and/or pottery. The relationships between Mesolithic and Neolithic peoples who coexisted for long periods of time have not been established. Certain cultural items enter the Mesolithic sites, possibly as a result of stimulus from nearby agriculturalists. Certainly the northern European late Mesolithic peoples of the Arctic Stone Age were in contact with Bronze/Iron Age peoples to the south. Elements of the Neolithic lifestyle were grafted to Mesolithic economic traditions to produce hybrids labelled "secondary Neolithic societies" (Gabel 1958b:97).

It is revealing that Clifford Jolly and Fred Plog, the authors of a recently published introductory text which seeks to integrate physical anthropology and archaeology, establish that the North American Archaic was identical in all respects to the European Mesolithic (Jolly and Plog 1976:207-213).

> About 10,000 years ago , adaptations that archaeologists define as the Mesolithic stage in Europe and the Archaic in North America began. During these stages, particular groups combined specilaized subsistence strategies to form more diversified strategies. In this sense, they are a logical consequence of processes that had been operating for thousands of years. Climatic factors too, played an important role in the changes that occurred (Jolly and Plog 1976:207).

The equatdion of the Mesolithic and Archiac traditions follows a pattern that dates to Spaulding's early research (Spaulding 1946). But Jolly and Plog make a simple correlation of the two and argue that they represent the same thing. On analogy with the Woodland occupations fo the lower Illinois river studied by Streuver (1968), they state that extensive and systematic trade patterns began at this time in both areas (Jolly and Plog 1976:215). Such may indeed be the case for this particular river valley, but no patterns have yet been clearly worked out in Europe which would serve to demarcate trade networks datable solely to the Mesolithic (but cf. Schild 1976). It is possible that the Baltic amber trade had its origins in the northern European Mesolithic, but it is normally associated with agricultural peoples (cf. Childe 1950:31; Clark 1952). In Northern Europe it was associated with peoples assigned to the category of the Arctic Stone Age. This was a circumpolar phenomenon found in the taiga zone from the Norwegian Coast across the Baltic and northern European plain far into Siberia (Childe 1957:203). It lasted into the Iron Age, and formed an unbroken continuity of tradition with the Maglemosean (Childe 1957:203). It was characterized by hunter/gatherer subsistence, and by the presence of distinctive "pit comb ware" pottery, as well as usage of antler, bone and polished slate artifacts (Childe 1957:204). Sites assignable to the Arctic Stone Age are labelled proto-Neolithic, and are adaptations to the circumpolar zone. Their status as Mesolithic is questionable only if the category of Mesolithic is defined as being early postglacial.

It is obvious that comparisons can be drawn between Europe and North America, as was done in chapter five, but Jolly and Plog go too far in accepting the Mesolithic and Archaic as identical. Such a statement could be ideally presented as an hypothesis for future testing. In their book it seems to be dogma, something that the conclusions already presented here should be able to refute successfully.

The basic problems of Mesolithic research (what it represents and explains, and how it stands in relation to Upper Palaeolithic and Neolithic traditions both in and outside Europe), can perhaps be solved by the generalized adaptation concept presented in chapter five.

Chapter VII

Summary and Conclusions

> There is as yet much information to be gained by excavations whose primary purpose is to help construct a chronology and typology for the Irish Mesolithic. Yet the near complete lack of information about the economy of these peoples, and in particular the lack of faunal remains, makes it imperative that future excavations be sited and undertaken with the primary purpose of recovering as much organic material of all forms as a means of attempting to understand how these people lived. The faunal and other remains which, perhaps due to the poor soil conditions of the northeast of Ireland, are so sadly lacking on many of our sites should be primary sources of information. Tools and weapons, while useful, are after all only secondary sources which can be perhaps over ordered and studied as a rather sterile end-product in themselves (Woodman 1973/4:14-15).

This study began as an historical project which sought to delineate the range of ideas concerning the human past which have been offered since the mid-19th century. Early postglacial research was chosen as a focus since it clearly paralleled the growth of the prehistoric discipline as a whole, and since it has provided some of the most significant (and successful) attempts to 'explain' prehistory.

It has been a characteristic of recent archaeological research to depend on technological designations formulated in the last century, while in turn attempting to construct detailed human ecological frameworks on them. Prehistorians in general must come to grips with the nature of the information which they have chosen to use, and this situation creates a need to understand and manipulate basic, often unconsciously accepted terminology.

The numerous junior synonyms, if such an anology can be made, which represent the body of knowledge concerning early postglacial prehistory were examined. As a result, it became apparent that these were formulated under an hypothesis, first presented by Obermaier in 1924, of the existence of two separate adaptational patterns. A general theme presented here, based on these case studies of Table IV, postulates that no cultural manifestation can be adequately defined solely on the basis of its technological component.

An argument was offered which proposed a new definition of the Mesolithic which is wider ranging in its implications than previous ones. This hypothesis is presented only as a possible medium under which research can be carried out. If acceptable, it requires the adoption of a number of basic premises. The first is that economic evidence must become the paramount priority. Second, prehistorians must establish the importance of treating their field as prehistory rather than archaeology, and must examine and search for the range of information which both history and anthropology demonstrate should be present. The third point is derived from the first two. Prehistorians must search for settlement sites which provide information on prehistoric lifestyles and adaptations, in addition to providing the material artifacts present.

No explanation which relies on a human ecological adaptational model can be presented without reference to detailed palaeoenvironmental data. This involves mainly faunal and floral analyses. Presence/absence charts of genera and/or species have long been a part of Mesolithic site reports. These must be presented, but in addition to arguments on resource collection based on studies of the modern parameters of individual forms, and their ecological requirements. The frequency of appearance of species in terms of individuals must be calculated. Jarman's work shows the beginnings of this (cf. Jarman 1972). A more difficult computation is the relative importance of each form in the diet of the people represented by the archaeological site. The attempt by Shawcross (1967) is a means to this end.

Additional work is required to be done by specialists in palynology, or by archaeologists trained in palaeoenvironmental research, first to examine the nature of early postglacial faunal and vegetational changes, then to hypothesize the impact that these may have had on contemporary hunter/gatherer societies. The basic question must be to what extent are the archaeological manifestations the result of such changes? One must test the degree of cultural closeness or difference between sites in a given area in an attempt to delineate the economic criteria behind archaeological classification. It is not logical to operate under a previous conception of Mesolithic adaptations; Brinch-Petersen's recent statement to the Warsaw conference (Brinch Petersen 1973) undelies this point of view.

Perhaps the most important basic need is for general syntheses of European prehistory. The nature of political fragmentation in the continent is such to have prohibited in the past the clear exchange of ideas concerning prehistory. Many of the classificatory tools of this particular tradition were produced as a result of ignorance of research developments in other countries. But many individual states even lack their own syntheses of basic culture history. The series of reports published by the Thames and Hudson company (Alexander 1972; Berciu 1967; Clark 1970; Jazdzewski 1965; Klindt-Jensen 1957; de Laet 1958; Neustúpny and Neustúpny 1961, Savory 1968) have clarified some aspects of regional prehistory, but each contains only a token amount of information on so-called Mesolithic traditions.

The direction which Mesolithic research must take in the future is becoming clarified. It must align itself with economic and geographical models, and must in turn contribute to them. The most effective medium for this approach is the general field of Quaternary research, which seeks to examine the full range of natural and human phenomena observable in the record of the Pleistocene and the Holocene. Quaternary investigations may in fact delineate more fully the nature of human ecological relations in their proper light as part of a greater system of inter-connected behaviours.

As Sir Daniel Wilson, one of the first professional archaeologists to work in Canada, once remarked, the relationship between man and nature is the basic concern of prehistorians. After all, "in Europe we study man only as he has been moulded by a thousand external circumstances" (Wilson 1876:7).

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APPENDIX

THE MESOLITHIC IN EUROPE 5000-15,000 B.P.

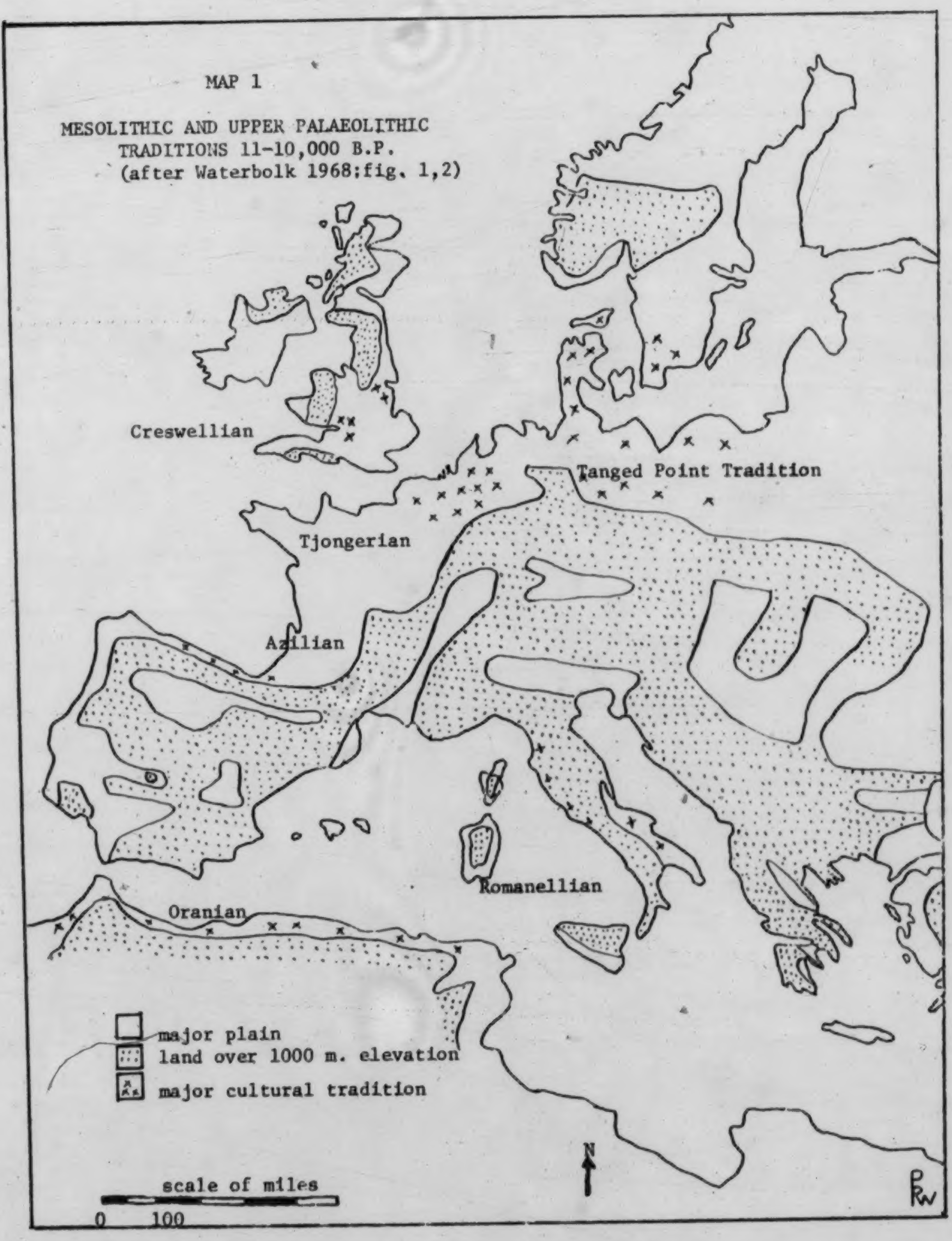
Maps and Radiocarbon Dates

Information Relating to Maps

Map 1 is drawn from Waterbolk 1968 and demonstrates the close relationship of Mesolithic traditions with land presently under 1000 metres in elevation, especially in northern Europe.

Maps 2 through 13 are a series of site distribution representations drawn for thousand year intervals. These are based solely on radiocarbon information. When a calibrated B.C. date (or an uncalibrated one older than 4000 B.C.) is given, the number 1950 was added to it in order to give it a date B.P. (relative to 1950 A.D.). Dates younger than 4000 B.C. were roughly calibrated using the Suess bristlecone pine sequence provided by Colin Renfrew (1971: 66-7). Dates older than this and given in B.P. values are left as they were. This may cause some confusion between uncalibrated and calibrated dates, so all information is provided in tables which refer to each map. These tables give the number of each site on a particular map, the name of the site, the radiocarbon lab number (whenever possible), the date itself, and any other information felt to be pertinent for identification. Sources used to compile these maps were: Radiocarbon (various issues); Camps and Camps-Fabrer 1972; Churchill and Wymer 1965; G.A. Clark 1971; J.G.D. Clark 1975; Debrosse and Giraud 1974; Delibrias and Evin 1974; Degerbøl 1961; Jacobsen 1969a; Kozlowski 1973a and 1973b; Mellars 1974; Price et. al. 1974; Tauber 1972; Turnbull and Reed 1974; Wendland and Bryson 1974; Woodman 1973/4).

Positions of sites are as exact as possible, but in many cases are in approximate locations only.



MAP 1

MESOLITHIC AND UPPER PALAEOLITHIC TRADITIONS 11-10,000 B.P. (after Waterbolk 1968:fig. 1,2)

Creswellian
Tanged Point Tradition
Tjongerian
Azilian
Romanellian
Oranian
major plain
land over 1000 m. elevation
major cultural tradition
N
scale of miles
0
100
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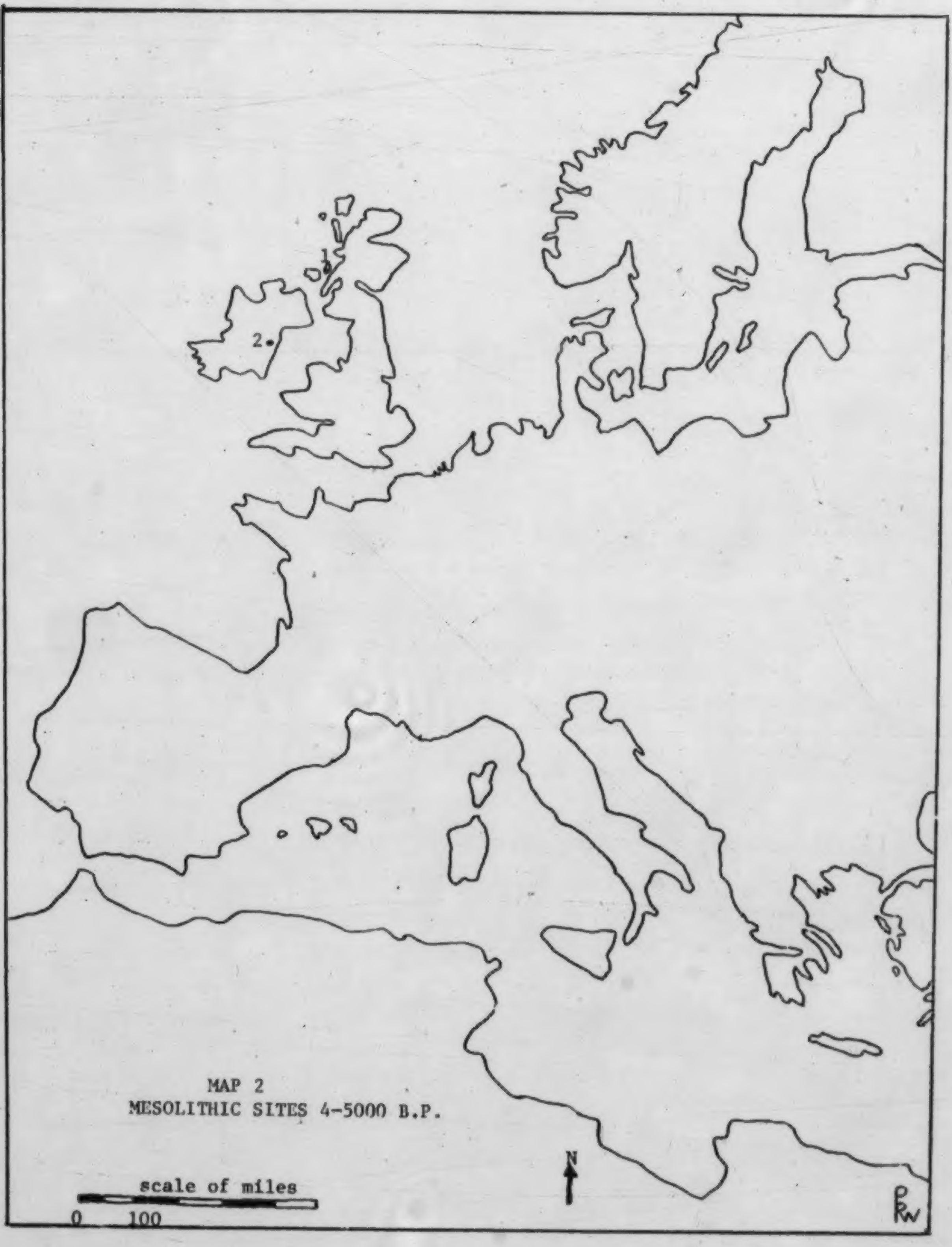
2.
scale of miles
0
100
N
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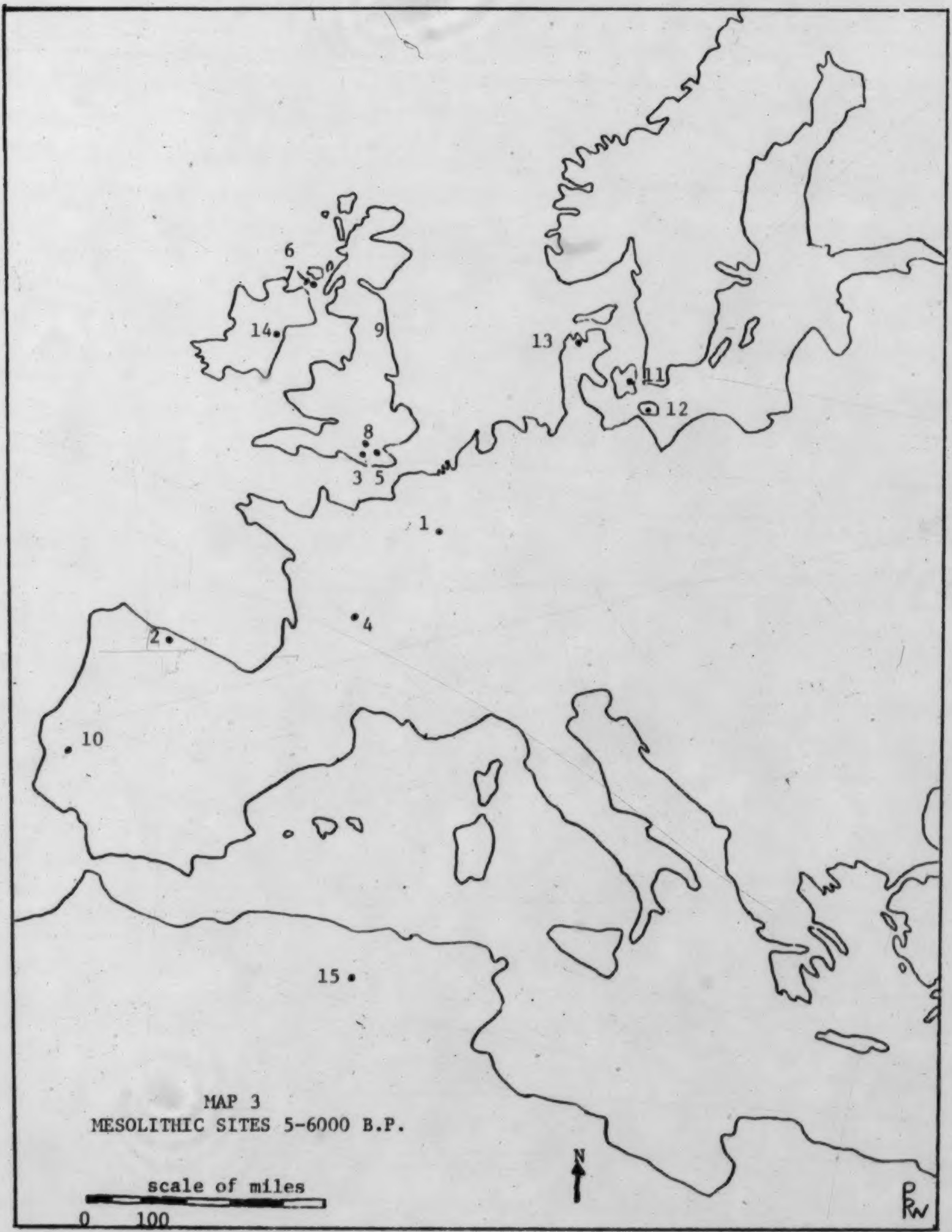
MAP 2
MESOLITHIC SITES 4-5000 B.P.

Data Concerning Map 2

Number on map	Site	Lab Number	Date	Information and source
1	Lussa River	BM-555	4900 B.P., calibrated	associated with geoemtric microliths (Mellars 1974:99)
		BM-556	4600 B.P., calibrated	associated with geometric microliths (Mellars 1974:99)
2	Dalkey Island, Co. Dublin Eire	BM-78	4260±150 B.P., calibrated as 4900 B.P.	Larnian shell midden (*Radiocarbon* 3:42)



MAP 3
MESOLITHIC SITES 5-6000 B.P.

6
7
14
9
13
11
12
8
3
5
1
4
2
10
15
N
scale of miles
0
100
PRW

Data Concerning Map 3

Number on map	Site	Lab Number	Date	Information and source
1	Coincy-en-Tardenois	Gif-132	4740±350, calibrated as 5840 B.P.	Hearth 2, La Chambre aux Fees (*Radiocarbon* 8:82)
		Gif-133/4	5040±500 B.P., calibrated as 5700 B.P.	'Tardenoisian', hearth 3,4, same (*Radiocarbon* 8:82)
2	La Lloseta	Gak-2551	4594±680 B.P., calibrated as 5380 B.P.	Sample B, 'post-Asturian' (Clark 1971:1255)
3	Freshwater West	Q-530	4010±110 B.P., calibrated as 5900 B.P.	Mesolithic (Mellars 1974:98)
4	Pointe de la Torche	not given	5970±80 B.P.	Hoëdic culture (Kozlowski 1973a:348)
5	High Rocks	BM-40	3710±150 B.C., calibrated as 4470 B.C., 5600 B.P.	site F, layer 2; "apparently associated with geometric microliths" (Mellars 1974:98)
		BM-91	3780±150 B.C., calibrated as 4550 B.C., 5720 B.P.	same (Mellars 1974:98)

Data Concerning Map 3

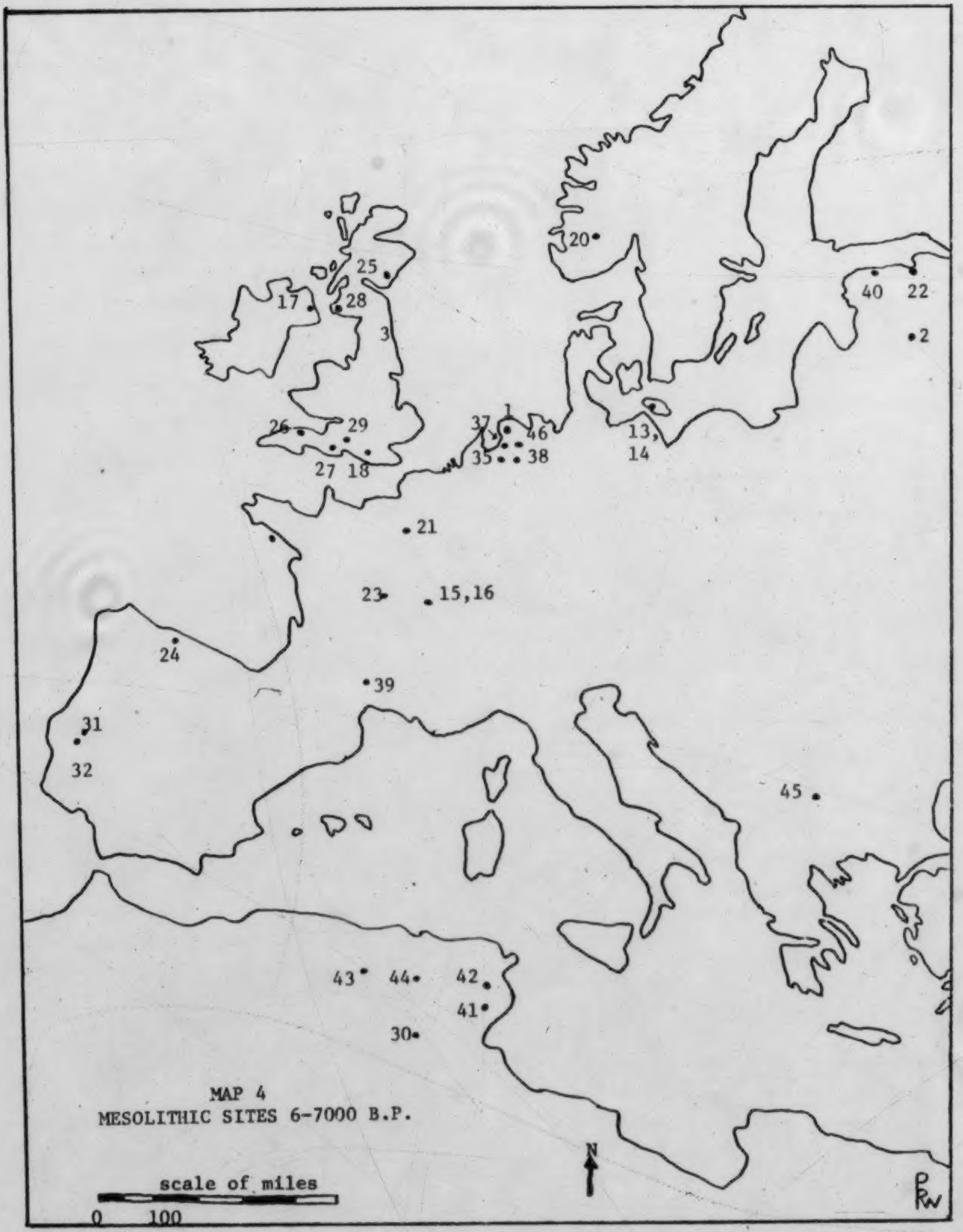
Number on map	Site	Lab Number	Date	Information and source
6	Caisteal-nan-Gillean	Birm-347	3500±140 B.C., calibrated as 4350 B.C., 5480 B.P.	basal portion of Oronsay shell midden (Mellars 1974:98)
		Birm-348	3900±310 B.C., calibrated as 4800 B.C., 5820 B.P.	same level, felt to be too old as as result of hard water error (Mellars 1974:98)
		Birm-346	3200±380 B.C., calibrated as 3970/4210 B.C., 5120/5180 B.P.	upper portion of midden (Mellars 1974:98)
7	Cnoc Sligeach	GX-1903	3065±210 B.C., calibrated as 3750/4160 B.C., 4950/5100 B.P.	Obanian shell midden (Mellars 1974:98)
		GX-1904	3805±180 B.C., calibrated as 4580 B.C., 5750 B.P.	same (Mellars 1974:98)
8	Wawcott Farm	BM-449	3310±130 B.C., calibrated as 4230/4010 B.C., 5330/5220 B.P.	hearth associated with geometric microliths (Mellars 1974:98)

Data Concerning Map 3

Number on map	Site	Lab Number	Date	Information and source
9	Dunford Bridge	Q-799	3430±80 B.C., calibrated as 4330 B.C., 5320 B.P.	site B, hearth with geometric microliths (Mellars 1974:99)
10	Cabeço da Arruda	Sa-196	5160±300 B.P., also 5150±300 B.P.	level 3-6 of Muge shell midden (Roche 1969: 161; 1972b:94; Radiocarbon 7: 238)
11	Ølby Lyng	not given	±3300 B.C., calibrated as 5950 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
		not given	range of 4200/ 4100 B.C., calibrated as 6150/6050 B.P.	same (Tauber 1972:107)
12	Lietzow-Buddelin	BLN-560	3240±100 B.C., calibrated as 5930 B.P.	upper layer, level 1, Ertebølle-Ellerbeck (Kozlowski 1973a: 344; Radiocarbon 12(2):402)
13	Ertebølle	not given	3800/3150 B.C., calibrated as 6500/5900 B.P.	Ertebølle (Tauber 1972:107)
14	Dalkey Island	D-38	5300±170 B.P., calibrated as 5970 B.P.	shell midden, transitional from Mesolithic to Neolithic (Radiocarbon 3:32)

Data Concerning Map 3

Number on map	Site	Lab Number	Date	Information and source
15	Columnata	Gif-107	5250±250 B.P., calibrated as 5970 B.P.	100-130 cm., Upper Capsian (*Radiocarbon* 12(2):435)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scale of miles
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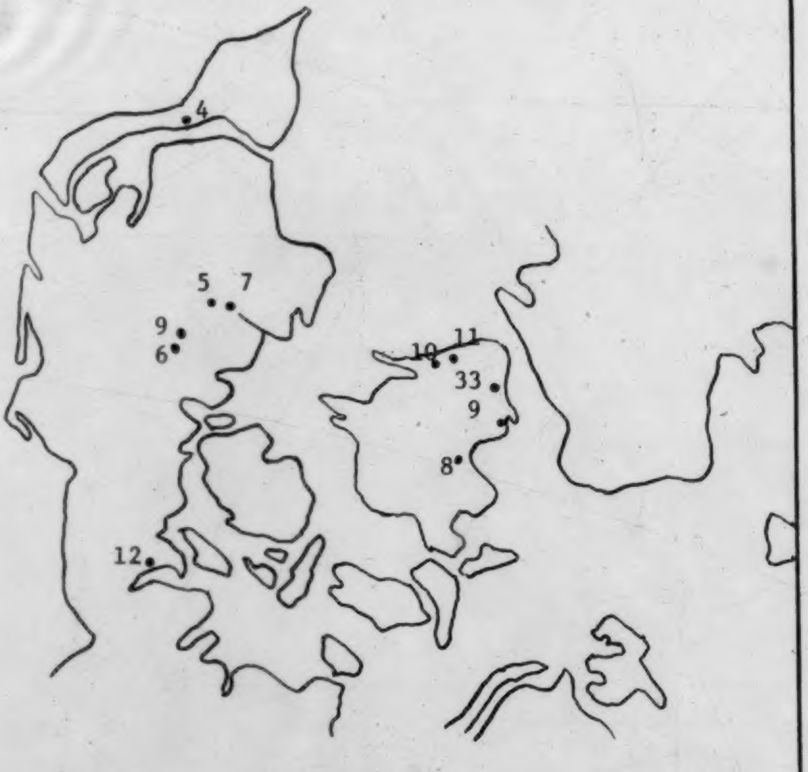
MAP 4
MESOLITHIC SITES 6-7000 B.P.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8
12

MAP 5
MESOLITHIC SITES IN DENMARK
6-7000 B.P.

N
RW

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
1	Bergumermeer, De Leien	not given	5010±140 B.C., 6960±140 B.P.	De Leien-Wartena culture (Kozlowski 1973a:341)
		not given	4845±70 B.C., 6795±70 B.P.	same (Kozlowski 1973a:341)
2	Osa	not given	5010±80 B.C., 6960±80 B.P.	lowel level, Kunda culture (Kozlowski 1973a: 350)
		not given	4630±70 B.C., 6580±70 B.P.	same (Kozlowski 1973a:350)
3	Thorpe Common	Q-1116	4483±115 B.C., 6433±115 B.P.	hearth with geometric microliths (Mellars 1974:97)
		Q-1118	3730±150 B.C., calibrated as 6400 B.P.	from above Q-1116; geometric microliths (Mellars 1974:97)
4	Brovst	not given	±3650 B.C., calibrated as 6450 B.P.	layer 4, Ertebølle (Tauber 1972:107; Kozlowski 1973a:343)
		not given	±4700 B.C., calibrated as 6650 B.P.	layers 9-11, Kongemose (Kozlowski 1973a:343; Tauber 1972:107)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
5	Flynderhage	not given	±3300 B.C., calibrated as 6100 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
6	Haldrup Strand	not given	±3700 B.C., calibrated as 6500 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
7	Norslund	not given	±3750 B.C., calibrated as 6550 B.P.	Ertebølle (Kozlowski 1973a:343) or Early Coastal (Kongemose) (Tauber 1972: 107) layer 3
		not given	±4500 B.C., calibrated as 6450 B.P.	layer 4, Kongemose (Kozlowski 1973a:341)
8	Ølby Lyng	not given	range of 4200/411 B.C., calibrated as 6450/6350 B.P.	Ertebølle (Tauber 1972:107)
9	Ringkloster	not given	3650/3550 B.C., calibrated as 6450/6350 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
10	Salpetermossen	not given	range of 4050/3450 B.C., calibrated as 6850-6250 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
11	Solanger	not given	±3550 B.C., calibrated as 6350 B.P.	Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
12	Satruper Moor-Forstenmoor	not given	3830±160 B.C., calibrated as 6500 B.P.	upper layer, Ertebølle (Kozlowski 1973a:343; Tauber 1972:107)
	Satruper Moor-Rude 2	not given	±3400 B.C., calibrated as 6180 B.P.	upper layer, Ertebølle (Kozlowski 1973a:343)
13	Lietzow-Augustenhof	not given	3505±100 B.C., calibrated as 6330 B.P.	lower layer, Ertebølle (Kozlowski 1973a:344)
14	Lietzow-Buddelin	not given	3864±100 B.C., calibrated as 6480 B.P.	lower level, Ertebølle (Kozlowski 1973a:344)
		BLN-561	5815±100 B.P., calibrated as 6600 B.P.	Ertebølle-Ellerbeck (Radiocarbon 12(2): 402)
15	Birsmatten-Basisgnotte	not given	3360±40 B.C., and 3400_120 B.C., calibrated as 6050 B.P.	layers 1,2 Montbani culture (Kozlowski 1973a: 348)
16	Birsmatten-Basishohle	B-234	5350±120 B.P., calibrated as 6150 B.P.	level 1b, Tardenoisian (Radiocarbon 3:23)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
16	Birsmatten-Basishohle	B-235	5310±240 B.P., calibrated as 6160 B.P.	level 2b, Tardenoisian (*Radiocarbon* 3:23)
		B-236	6970_120 B.P.	level 3b, Sauveterrian (*Radiocarbon* 3:23)
17	Ringneill Quay, Eire	Q-770	5380±120 B.P., calibrated as 6230 B.P.	occupation 3, Mesolithic kitchen midden Mesolithic/Neolithic transition (*Radiocarbon* 6:127)
18	Freshwater West	Q-530	5960±120 B.P., calibrated as 6800 B.P.	zone VII or later (post Boreal) (*Radiocarbon* 6:127)
19	Christiansholms Mose	K-729	5310±100 B.P., calibrated as 6160 B.P.	'late Ertebølle' (*Radiocarbon* 6:217; Troels-Smith 1966/7:525)
		K-750	5370±100 B.P., calibrated as 6330 B.P.	same (*Radiocarbon* 6:217; Troels-Smith 1966/7:525)
20	Gyrinos	K-711	5700±120 B.P., calibrated as 6450 B.P.	Fosna Mesolithic level IV (*Radiocarbon* 6:224)
21	Boutigny sur Essonne	Sa-79	5410±300 B.P., calibrated as 6300 B.P.	Mesolithic (*Radiocarbon* 6:247)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
22	Narva	TA-7	5300±250 B.P., calibrated as 6000 B.P.	'Mesolithic I' (Radiocarbon 8:431)
		TA-33	5820±200 B.P., calibrated as 6850 B.P.	'Mesolithic I' (Radiocarbon 8:432)
		TA-17	6020±120 B.P., calibrated as 6850 B.P.	'Mesolithic II' (Radiocarbon 8:432)
		TA-40	6740±250 B.P. uncalibrated	'Mesolithic II' (Radiocarbon 8:432)
		not given	4955±210 B.C., 6905±210 B.P. uncalibrated	lowel layer, Kunda culture (Kozlowski 1973a: 350)
23	La Torche	GrN-2001	5970±80 B.P., calibrated as 6800 B.P.	Mesolithic kitchen midden (Radiocarbon 5:176)
24	Les Pedroses	Gak-2547	5933±185 B.P., calibrated as 6800 B.P.	'post-Asturian' (Clark 1971: 1255)
25	Morton	NZ-1192	4840±150 B.C., 6790±150 B.P.	site A, non-geometric microliths (Mellars 1974:96)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
25	Morton	NZ-1193	4450±125 B.C., 6400±125 B.P.	site A, non-geometric industry (Mellars 1974:96)
		Q-989	4500±80 B.C., 6450±80 B.P.	site A, non-geometric industry (Mellars 1974:96)
		Gak-2404	4350±150 B.C., 6220 B.P. (calibrated)	same (Mellars 1974:96)
		Q-948	4785±180 B.C., 6735±180 B.P.	same (Mellars 1974:96; *Radiocarbon* 12(2):597)
		Q-981	4432±120 B.C., 6382±120 B.P.	site B, lower midden deposit (Mellars 1974:97)
		Q-988	4197±90 B.C., calibrated as 6150 B.P.	site B, lower midden deposit (Mellars 1974:97)
		Q-928	4165±110 B.C., calibrated as 6120 B.P.	site B, upper midden deposit (Mellars 1974:97)
26	Westward Ho!	Q-672	4635±130 B.C., 6585±130 B.P.	base of peat deposit overlying shell midden with geometric microliths (Jacobi 1973:250; Mellars 1974:97; Churchill and Wymer 1965:81; *Radiocarbon* 6:126)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
27	Blashenwell	BM-89	4500±150 B.C., 6450±150 B.P.	shell midden with microliths, Mesolithic or Maglemosean on the basis of finds of *tranchants* (Mellars 1974:97; Jacobi 1973:250; *Radiocarbon* 3:40)
28	Barsalloch	Gak-1601	4050±110 B.C., calibrated as 6000 B.P.	geometric microliths (Mellars 1974:98)
29	Oakhanger site VII	F-67	4350±110 B.C., calibrated as 6150 B.P.	non-geometric microliths (Mellars 1974:97)
		F-68	4430±110 B.C., 6380±110 B.P.	same (Mellars 1974:97)
30	El Oued	not given	4750 B.P., calibrated as 6700 B.P.	*Capsien typique* (Camps and Camps-Fabrer 1974:57)
31	Cabeço da Amoreira	Sa-194	6050±300 B.P., calibrated as 6850 B.P.	level 3/4 (Roche 1965:161; 1972b:94; *Radiocarbon* 7:237)
32	Cabeço da Arruda	Sa-197	6430±300 B.P.	level 41/45 (*Radiocarbon* 7:238)
		not given	6430±300 B.P.	level 71/82 (Roche 1972b:94)

Data Concerning Maps 4 and 5

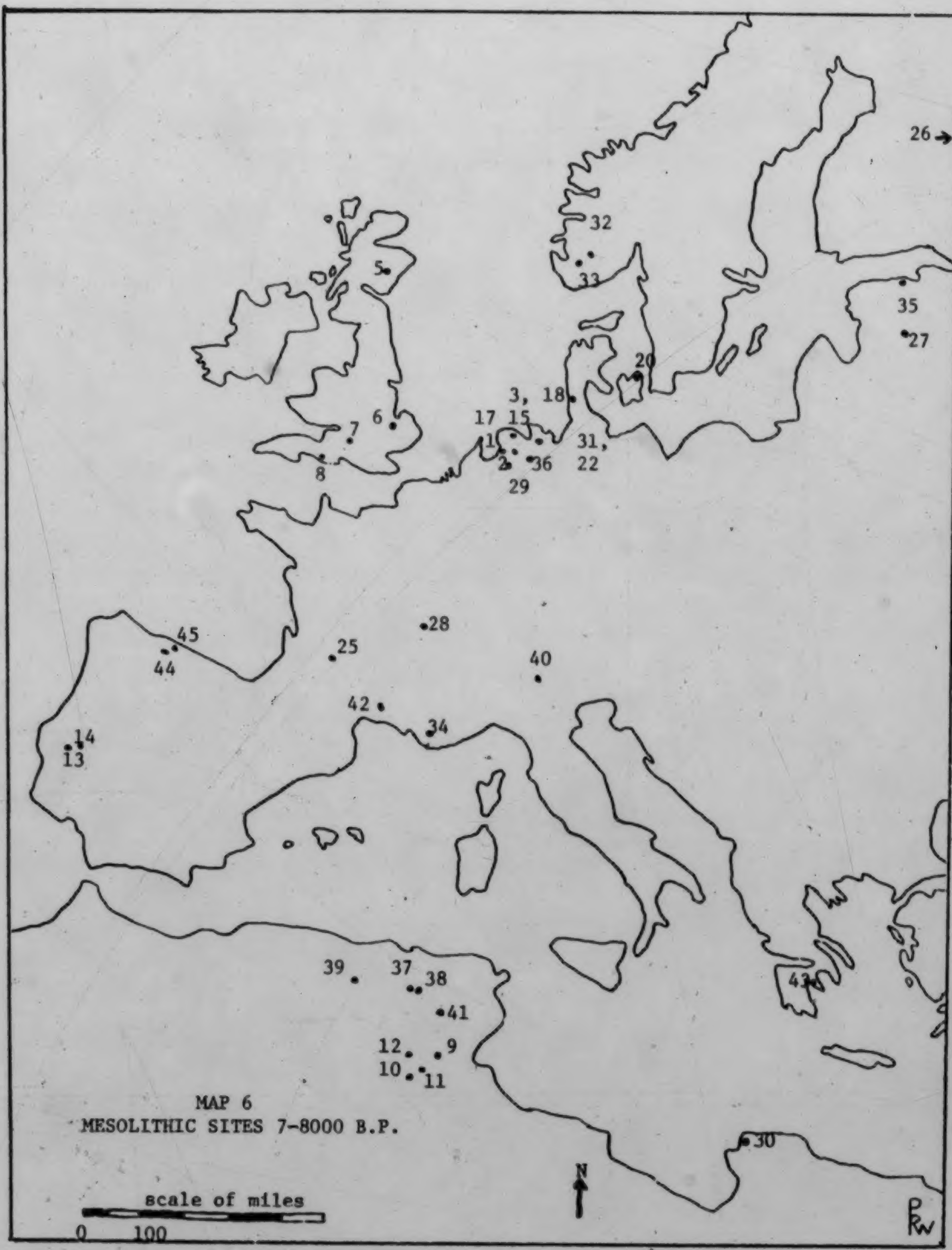
Number on map	Site	Lab Number	Date	Information and source
33	Vedbaek Bolbaner	not given	±4500 B.C., calibrated as 6500 B.P.	Ertebølle (Kozlowski 1973a: 343; Tauber 1972: 107)
34	Henriksholm (not shown on map)	not given	4100 B.C., calibrated as 6050 B.P.	Kongemose (Kozlowski 1973a: 343)
		not given	range of 4200/3950 B.C., calibrated as 6100/5850 B.P.	same (Tauber 1972:107)
35	Beezer Belten	GrN-2418	4710±90 B.C., 6660±90 B.P.	Boberg culture, felt to be too young (Kozlowski 1973a:345; Radiocarbon 9:123)
36	Hoëdic	not given	4625±350 B.C., 6575±350 B.P.	Hoëdic culture (Kozlowski 1973a: 348)
37	Oirschot	GrN-2172	6690±65 B.P.	level VII, felt to be too young (Radiocarbon 5:174)
38	Maarheeze	GrN-2446	6230±115 B.P., calibrated as 7300 B.P.	Mesolithic, felt to be too young (Radiocarbon 5: 175-6)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
39	Shelter Jean Cros, Labastide en Val, Aude	Gif-218	6500±300 B.P.	Mesolithic (Radiocarbon 8:85)
40	Kunda	TA-16	6015±210 B.P., calibrated as 6870 B.P.	late Mesolithic (Radiocarbon 8:432-3)
41	Medjez II	MC-151	6500±100 B.P.	Medjez II 1, Upper Capsian escargotière (Radiocarbon 11(1):436)
		Gif-462	6620±300 B.P.	Upper Capsian (Radiocarbon 12(2_:436)
42	Ain Boucheret	MC-209	6800±100 B.P.	Ain Boucheret 1, Upper Capsian escargotière (Radiocarbon 11(1):124)
43	Columnata	MC-153	6800±100 B.P.	Columnata 2, transition from Iberomaurusian to Upper Capsian (Radiocarbon 11(1): 125-6
		Gif-308	6850±300 B.P.	160-200 cm. Upper Capsian (Radiocarbon 12(2):435)

Data Concerning Maps 4 and 5

Number on map	Site	Lab Number	Date	Information and source
43	Columnata	Gif-309	6340±300 B.P.	200-230 cm., Upper Capsian to Neolithic of Capsian Tradition (Radiocarbon 12(2):435)
44	El Marmouta	ALG-18	6450±260 B.P.	El Marmouta 4, Upper Capsian (Radiocarbon 12(2):355)
45	Lepenski Vir	BM-379	6900±150 B.P.	pre-Starcevo (Radiocarbon 11(2):292)
		P-1598	6814±69 B.P.	level Id, proto-Neolithic (Radiocarbon 13(2):363)
46	Havelte de Doeze	GrN-6655	6050±75 B.P.	HI: feature 20, HI:II (Price et. al. 1974:58)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scale of miles
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MAP 6
MESOLITHIC SITES 7-8000 B.P.

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
1	Oirschot	GrN-2172	6230±60 B.P., calibrated as 7300 B.P.	felt to be too young (Radiocarbon 5:174)
2	Maarheeze	GrN-2446	6230±115 B.P., calibrated as 7300 B.P.	Mesolithic, felt to be too young (Radiocarbon 5: 175-6)
3	Haule I	not given	6015±370 B.C., 7965±370 B.P.	Boberg culture (Kozlowski 1973a: 345)
		not given	5575±200 B.C., 7525±200 B.P.	same (Kozlowski 1973a:345)
4	Sigers-woude II (not shown on map)	not given	6010±70 B.C., 7960±70 B.P.	same (Kozlowski 1973a:345)
5	Morton	NZ-1302	5380±200 B.C., 7330±200 B.P.	non-geometric industry, site A (Mellars 1974:96)
6	Peacock's Farm	Q-587	5650±150 B.C., 7600±150 B.P.	geometric industry (Mellars 1974:97)
7	Cherhill	BM-447	5280±140 B.C., 7230±140 B.P.	base of tufa overlying level with geometric microliths; Sauveterrian and Maglemosean (Mellars 1974:97; Radiocarbon 13(2): 168)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
8	Culyerwell	BM-473	5200±135 B.C., 7150±135 B.P.	basal shell midden, geometric microliths; Sauveterrian and Maglemosean (Mellars 1974:97; Jacobi 1973:250; Radiocarbon 13(2): 169)
9	Bortal Fakher	not given	5650 B.C., 7600 B.P.	Capsien typique (Camps and Camps-Fabrer 1972:57)
10	Relilai	not given	5140 B.C., 7090 B.P.	same (Camps and Camps-Fabrer 1972: 57)
11	Guentis	not given	5140 B.C., 7090 B.P.	same (Camps and Camps-Fabrer 1972: 57)
12	El Oued	not given	5900 B.C., 7850 B.P.	same (Camps and Camps-Fabrer 1972: 57)
13	Moita do Sebastião	Sa-16	7350±350 B.P.	base level (Radiocarbon 6:244; Roche 1965:160, 1972b:94)
14	Cabeço da Amoreira	Sa-195	7030±350 B.P.	lower shell level (Radiocarbon 7: 238; Roche 1965: 161, 1972b:94)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
15	Bergumermeer De Leien	GrN-1638	5280±65 B.C., 7230±65 B.P.	De Leien-Wartena, also felt to be Maglemosean (Kozlowski 1973a:341; *Radiocarbon* 5:176)
16	Tieterk (not shown on map)	not given	5800±75 B.C., 7750±75 B.P.	De Leien-Wartena culture (Kozlowski 1973a: 341)
		not given	5555±75 B.C., 7505±75 B.P.	same (Kozlowski 1973a: 341)
17	Wartena	GrN-4325	5500±75 B.C., 7450±75 B.P.	same (Kozlowski 1973a:341)
18	Kongemosen	not given	±5500 B.C., ±7450 B.P.	Kongemose (Kozlowski 1973a: 343)
		not given	range of 5600/5350 B.C. 7550/7300 B.P.	same (Tauber 1972:107)
19	Maanedalen (not shown on map)	not given	±5650 B.C., ±7600 B.P.	same (Kozlowski 1973a:343)
20	Villingebaek Øst A	not given	±5200 B.C., ±7150 B.P.	same (Kozlowski 1973a:343)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
20	Villingebaek Øst A	not given	range of 5350/5100 B.C., 7300/7050 B.P.	Kongemose (Tauber 1972:107)
21	Drouvener Zand I (not shown on map)	not given	5925±90 B.C., 7875±90 B.P.	Boberg culture (Kozlowski 1973a: 345)
22	Een II	not given	5775±100 B.C., 7725±100 B.P.	same (Kozlowski 1973a:345)
		not given	5850±100 B.C., 7800±100 B.P.	same (Kozlowski 1973a:345)
23	Waskemeer West (not shown on map)	not given	6570±50 B.C., 7620±50 B.P.	same (Kozlowski 1973a:345)
24	Waskemeer Oud-Lager (not shown on map)	not given	5505±120 B.C., 7455±120 B.P.	same (Kozlowski 1973a:345)
25	Rouffinac	not given	5810±50 B.C., 7760±50 B.P.	layer C-3, Cuzoul culture (Kozlowski 1973a:349)
		GrN-2889	7800±50 B.P.	layer C-3, 'pure Tardenoisian' (*Radiocarbon* 5: 175)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
26	Vis I	not given	5870±80 B.C., 7820±80 B.P.	(Kozlowski 1973a:350)
		not given	5200±60 B.C., 7150±60 B.P.	(Kozlowski 1973a:350)
		not given	5140±80 B.C., 7090±80 B.P.	(Kozlowski 1973a:350)
		not given	5140±70 B.C., 7090±70 B.P.	(Kozlowski 1973a:350)
27	Osa	not given	5218±160 B.C., 7168±160 B.P.	lower level, Kunda culture (Kozlowski 1973a:350)
28	Birsmatten-Basishohle	B-238	7460±160 B.P.	Mesolithic (*Radiocarbon* 3:23)
29	Duurswoude	GrN-1567	7700±70 B.P.	level IIIA, above Upper Palaeolithic Tjongerian (*Radiocarbon* 5:169)
		GrN-1173	7700±100 B.P.	level I, (*Radiocarbon* 5:169; Kozlowski 1973a: 345)
		GrN-1175	7710±70 B.P.	level II (Kozlowski 1973a:345; *Radiocarbon* 5:169)

Data Concerning Map 6

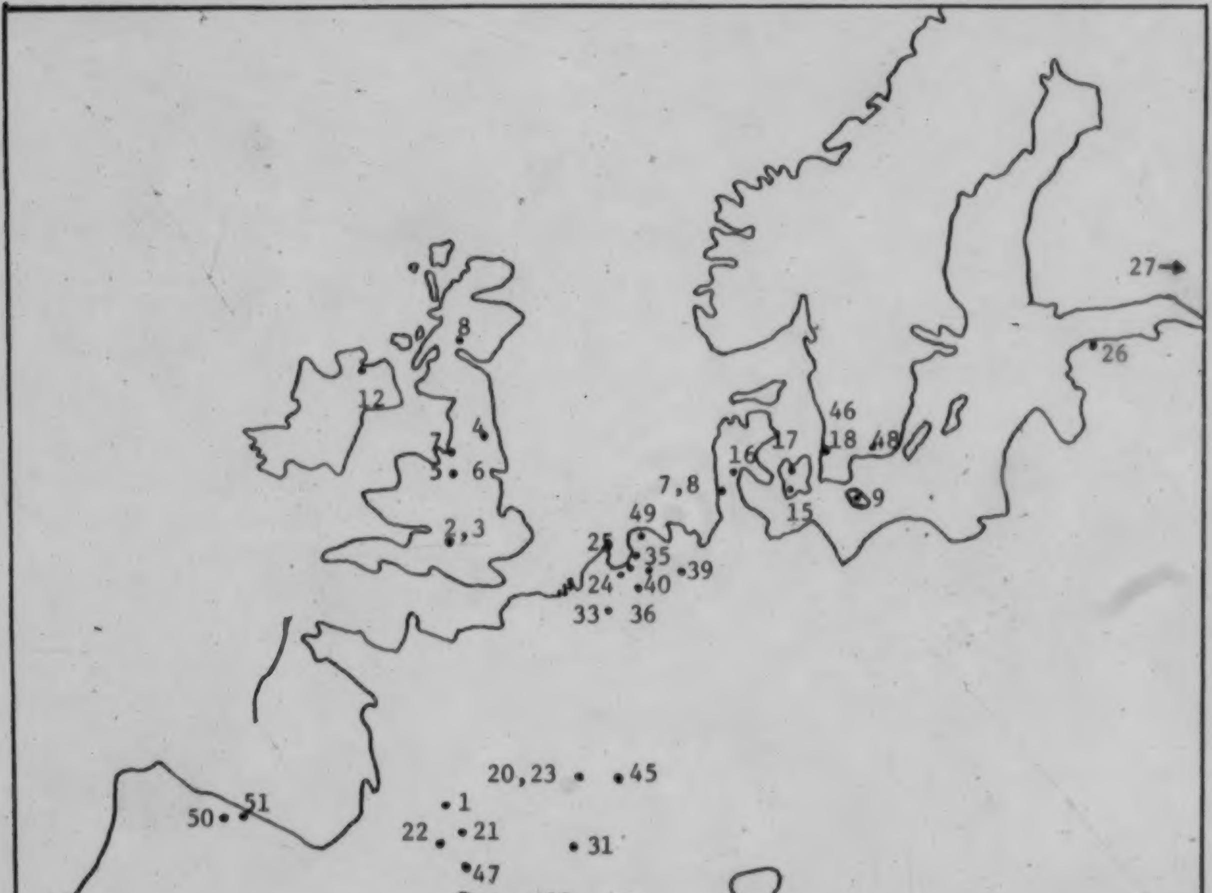
Number on map	Site	Lab Number	Date	Information and source
30	Haua Fteah	GrN-3541	7000±110 B.P.	final Mesolithic (Capsian) level 10 (*Radiocarbon* 5: 171)
31	Hatert	GrN-1602	7670±110 B.P.	Mesolithic (*Radiocarbon* 5: 174)
32	Gyrinos	K-710	7860±120 B.P.	Fosna (?) Mesolithic (*Radiocarbon* 6:224)
33	Digernes I	K-712	7410±130 B.P.	(*Radiocarbon* 6:224)
34	Grotta Arma dello Stefano	R-109	7800±100 B.P.	Epipalaeolithic level IV (*Radiocarbon* 7:215)
35	Narva	TA-41	7090±230 B.P.	Mesolithic III (*Radiocarbon* 8: 432)
		TA-25	7580±300 B.P.	same (*Radiocarbon* 8:432)
		TA-53	7640±180 B.P.	same (*Radiocarbon* 8:432)
36	Wijster	GrN-4577	7980±60 B.P.	Mesolithic Wijster 581 (*Radiocarbon* 9:123)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information and source
36	Wijster	GrN-4575	7660±50 B.P.	Mesolithic Wijster 836 (*Radiocarbon* 9:123)
37	Medjez II	MC-213	7860±120 B.P.	Medjez II 2 (*Radiocarbon* 11(1):124)
		MC-214	7200±120 B.P.	Medjez II 3 (*Radiocarbon* 11(1):124) Upper Capsian *escargotière*
38	Ain Boucheret	MC-210	7000±150 B.P.	Ain Boucheret 2 (*Radiocarbon* 11(1):124)
39	Columnata	MC-154	7300±200 B.P.	level 3, transition from Iberomaurusian to Upper Capsian (*Radiocarbon* 11 (1): 126)
40	Vatte di Zambana	R-488a	7585±75 B.P.	level 5-HI (*Radiocarbon* 11 (2): 483-4)
		R-489a	7810±95 B.P.	level 7-HII (*Radiocarbon* 11 (2): 483-4)

Data Concerning Map 6

Number on map	Site	Lab Number	Date	Information on map
40	Vatte di Zambana	R-490a	7960±100 B.P.	level 10-II-III (*Radiocarbon* 11(2): 483-4)
41	R-Fana	Gif-306	7450±300 B.P.	R'Fana 1, Upper Capsian (*Radiocarbon* 12(2):435)
42	Gramari	Gif-752	7740±190 B.P.	Sauveterrian 'questionable' (*Radiocarbon* 13 (2): 219)
43	Franchthi Cave	P-1527	7897±88 B.P.	pit F/F-1, unit 44B5 (*Radiocarbon* 13(2): 366)
44	Coberizas B	Gak-2907	7313±175 B.P.	Asturian (Clark 1971:1255)
45	Bricia A	Gak-2908	7004±165 B.P.	Asturian (Clark 1971:1255)



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MAP 7
MESOLITHIC SITES 8-9000 B.P.

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
1	Rouffinac	not given	7005±105 B.C., 8955±105 B.P.	layer C4, Sauveterrian (Kozlowski 1973a:344)
		GrN-2913	8370±100 B.P.	layer C4b, upper Sauveterrian (Radiocarbon 5:175)
		GrN-2895	8590±95 B.P.	layer C4a, middle Sauveterrian (Radiocarbon 5:175)
		GrN-2880	8995±105 B.P.	layer C4a', lower Sauveterrian (Radiocarbon 5: 175)
2	Thatcham	BM-65	6140±180 B.C., 8090±180 B.P.	Site II layer 2, Maglemosean (perhaps contaminated)(Mellars 1974:95)
		BM-25	8100±180 B.P.	Classic Maglemosean (Radiocarbon 2:29)
3	Greenham Dairy Farm	Q-973	6829±110 B.C., 8779±110 B.P.	Maglemosean (Mellars 1974:95)
4	West Hartepool	BM-81	6730±180 B.C., 8680±180 B.P.	Mesolithic (Mellars 1974:95)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
4	West Hartepool	BM-80	6750±180 B.C., 8700±180 B.P.	Mesolithic (Mellars 1974:95)
		BM-90	6150±180 B.C., 8100±180 B.P.	Mesolithic (Mellars 1974:95)
		BM-83	6160±180 B.C., 8110±180 B.P.	Mesolithic (Mellars 1974:95)
5	Broomhead Moor	Q-800	6623±110 B.C., 8573±110 B.P.	Mesolithic, with geometric microliths, site 5 (Mellars 1974:95)
6	Stumpcross	Q-141	6500±310 B.C., 8450±310 B.P.	geometric microliths (Mellars 1974:95)
7	Ickornshaw	Q-707	6150±150 B.C., 8100±150 B.P.	same (Mellars 1974:96; *Radiocarbon* 6:125)
8	Morton	NZ-1191	6100±255 B.C., 8050±255 B.P.	non-geometric microliths (Mellars 1974:96)
9	Medjez II	not given	6910±150 B.C., 8860±150 B.P.	*Capsien supérieur* (Camps and Camps-Fabrer 1972:57)
10	Relilai	not given	6230 B.C. 8180 B.P.	*Capsien typique* (Camps and Camps-Fabrer 1972:57)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
11	Franchthi Cave	P-1518	6988±100 B.C., 8938±100 B.P.	Mesolithic (Jacobsen 1969a: 375)
		P-1518a	6767±100 B.C., 8717±100 B.P.	Mesolithic (Jacobsen 1969a: 375)
		P-1536	8189±78 B.P.	Pit G-1, unit 22, Mesolithic (Radiocarbon 13 (2): 365)
		P-152[illegible]	8022±76 B.P.	Pit F/F-1, unit 43A1, Mesolithic (Radiocarbon 13 (2): 366)
		P-1664	8941±117 B.P.	Pit H-1, A-101, Mesolithic (Radiocarbon 13(2); 366)
		P-1666	8742±114 B.P.	Pit H-1, unit A-117R, Mesolithic (Radiocarbon 13(2):366)
12	Mountsandel	UB-912	8725±115 B.P.	Pre-Larnian (Woodman 1973/4: 15)
		UB-913	8555±70 B.P.	same (Woodman 1973/4:15)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
13	Ter Horst (not shown on map)	not given	6840±100 B.C., 8790±100 B.P.	Duvensee culture (Kozlowski 1973a: 340)
14	Flessenow-Hassenberg (not shown on map)	not given	6600±145 B.C., 8550±145 B.P.	Boreal (Kozlowski 1973a:340)
15	Mullerup	not given	±6550 B.C., ±8500 B.P.	Maglemosean (Kozlowski 1973a: 339)
		not given	range of 6700/6400 B.C., 8650/8350 B.P.	same (Tauber 1972: 107)
16	Stallerupholm	not given	±6350 B.C., ±8300 B.P.	Boreal Maglemosean (Kozlowski 1973a: 339)
17	Ulkstrup II	not given	±6150 B.C., ±8100 B.P.	Maglemosean (Kozlowski 1973a:339)
18	Backaskog	not given	6850±100 B.C., 8800±100 B.P.	Maglemosean (Kozlowski 1973a: 339) Bare mosse II
19	Melsted	not given	6240±130 B.C., 8190±130 B.P.	Melsted culture (Kozlowski 1973a: 339; Tauber 1972: 107)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
20	Baume de Montclus	not given	±6180 B.C., ±8130 B.P.	Sauveterrian layer 18-22/22 (Kozlowski 1973a: 344)
21	Cuzoul de Gramat	not given	6380±100 B.C., 8330±100 B.P.	layer 1, Sauveterrian (Kozlowski 1973a:344)
22	Le Roc Allan	not given	6900±95 B.C., 8850±95 B.P.	layer 10, Sauveterrian (Kozlowski 1973a:344)
23	Balm Ogens	not given	6580±100 B.C., 8530±100 B.P.	Sauveterrian (Kozlowski 1973a:344)
24	Beezer Belten II	GrN-4057	6415±75 B.C. 8480±75 B.P.	Boberg culture (Kozlowski 1973a: 345; Radiocarbon 5:174-5)
25	Rosterhaule	GrN-3042	6415±75 B.C., 8365±75 B.P.	same (Kozlowski 1973a:345; Radiocarbon 5: 174-5)
26	Kunda	not given	6375±285 B.C., 8325±285 B.P.	lower layer, Kunda culture (Kozlowski 1973a: 350)
		TA-14	8340±280 B.P.	lower Mesolithic (Radiocarbon 8: 432)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
27	Vis	not given	6130±90 B.C., 8080±90 B.P.	Kunda culture (Kozlowski 1973a:350)
28	Berendeevo	not given	6830±100 B.C., 8780±100 B.P.	Upper Volga culture (Kozlowski 1973a: 350)
29	Ivanovski-Torfianik	not given	6880 B.C., 8830 B.P.	same (Kozlowski 1973a:350)
30	Saumanes: Abri de Chinchon	Ly-598	8980±850 B.P.	Azilian of a cold climatic phase (Delibrias and Evin 1974:153)
31	Maudre: grotte	Ly-430	8960±420 B.P.	Final Magdalenian or Azilian of Dryas III (Delibrias and Evin 1974:155)
32	Grotta la Porta	Pi-10	8619±200 B.P.	Mesolithic shell midden (Radiocarbon 1:106)
33	Milheeze	GrN-2318	8500±160 B.P.	Milheeze II, Mesolithic (Radiocarbon 5:170-1)
34	Haua Fteah	GrN-3167	8400±150 B.P.	Final Mesolithic (Radiocarbon 5: 171)

Data Concerning Map 7

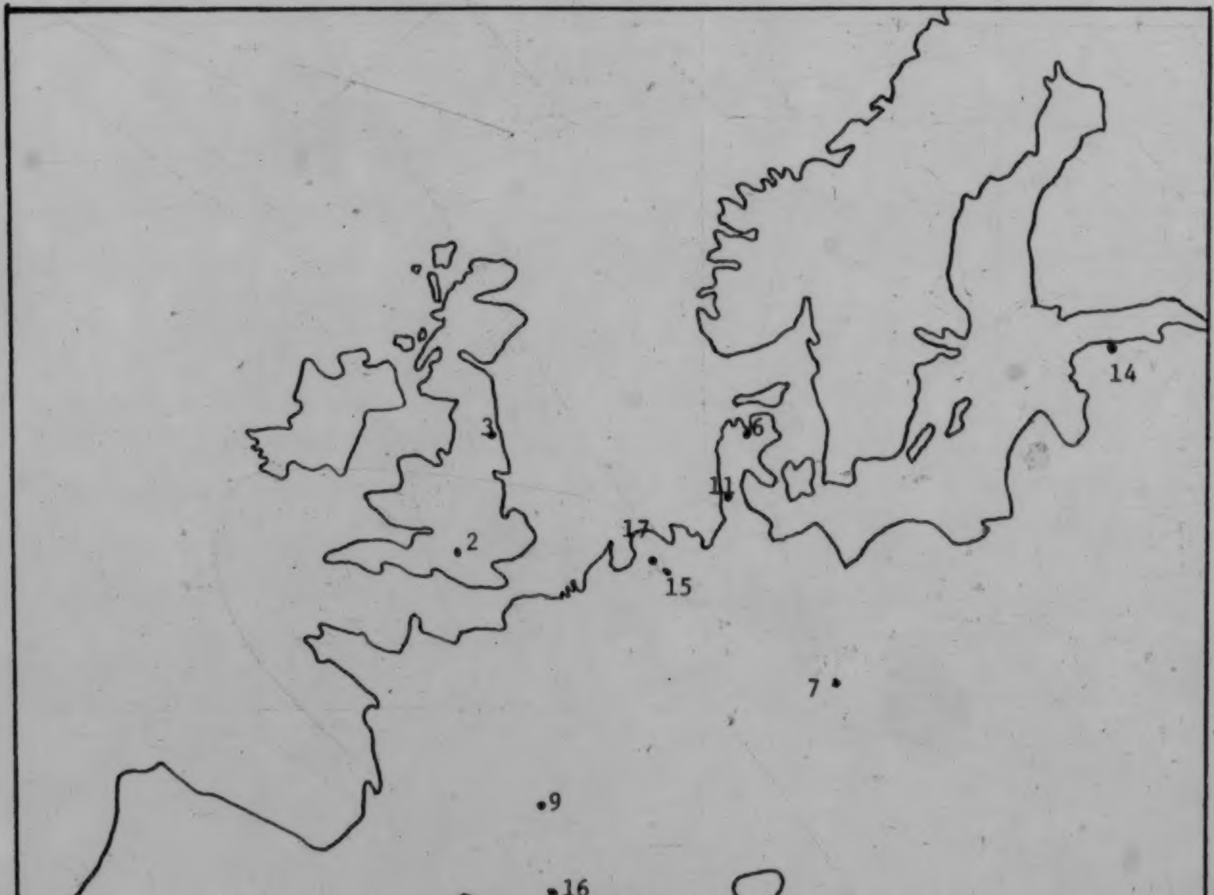
Number on map	Site	Lab Number	Date	Information and source
35	Oirschot	GrN-1659	8030±50 B.P.	Mesolithic, level Vb (*Radiocarbon* 5:174)
36	Ermelo	GrN-1559	8210±75 B.P.	Mesolithic (*Radiocarbon* 5:175)
37	Draved Mose	K-829	8390±150 B.P.	Klosterlund (*Radiocarbon* 8:226)
		K-790	8990±140 B.P.	same (*Radiocarbon* 8:227)
		K-841 K-791	8470±150 B.P.	same (*Radiocarbon* 8:227)
		K-1017	8250±170 B.P.	(*Radiocarbon* 8:227)
		K-1016	8180±190 B.P.	(*Radiocarbon* 8:227)
38	Kongemose	K-571	8830±110 B.P.	Old Coastal culture (*Radiocarbon* 8:228)
		K-570	8400±150 B.P.	same (*Radiocarbon* 8:228)
39	Mettingen	GrN-4870	8790±90 B.P.	Mesolithic (*Radiocarbon* 9:122)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
40	Wijster	GrN-4574	8400±80 B.P.	Mesolithic (Radiocarbon 9: 123)
41	Koudiat Kifen Lahda	MC-206	8050±150 B.P.	Epipalaeolithic (Radiocarbon 11 (1):125)
		MC-207	8320±150 B.P.	same (Radiocarbon 11(1): 125)
42	Columnata	MC-155	8280±200 B.P.	Iberomaurusian to Upper Capsian (Radiocarbon 11(1): 126)
		MC-211	8140±130 B.P.	same (Radiocarbon 11(1):126)
43	Hassi Mouillah	MC-150	8600±150 B.P.	Epipalaeolithic (Radiocarbon 11(1): 126)
44	Ain Naga	ALG-13	8900±280 B.P.	(Radiocarbon 12 (2): 355)
45	La Baume d'Ogens	B-764	8530±100 B.P.	layer 1, younger occupation (Radiocarbon 12(2):379-380)
		B-765	8735±150 B.P.	layer 2, older occupation (Radiocarbon 12(2):379-380)

Data Concerning Map 7

Number on map	Site	Lab Number	Date	Information and source
46	Bare Mosse	Lu-230	8800±100 B.P.	215-217 cm., Maglemosean (*Radiocarbon* 13(2):219)
		Lu-231	8970±100 B.P.	237-252 cm., same (*Radiocarbon* 12 (2):549)
47	Gramari	Gif-753	8000±190 B.P.	Sauveterrian, level 3B1, 3B2 (*Radiocarbon* 13(2):219)
48	Hagestad	Lu-373	8650±105 B.P.	level 6^{2}A, Mesolithic (*Radiocarbon* 13(2): 350)
49	Havelte de Doeze	GrN-6656	8725±60 B.P.	HI: feature 12, HI:II/HI:III (Price *et*.*al*. 1974:58)
50	Penical	Gak-2906	8909±185 B.P.	Asturian (Clark 1971:1255)
51	La Riera B	Gak-2909	8909±309 B.P.	same (Clark 1971: 1255)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MAP 8
MESOLITHIC SITES 9-10000 B.P.

Data Concerning Map 8

Number on map	Site	Lab Number	Date	Information and source
1	Ter Horst (not shown on map)	not given	7230±80 B.C., 9180±80 B.P.	Duvensee culture (Kozlowski 1973a: 340)
2	Thatcham	Q-651	7890±160 B.C.,	site V 3, Maglemosean (Kozlowski 1973a:340; Mellars 1974:94; *Radiocarbon* 6: 122-3)
		Q-677	7830±200 B.C., 9780±200 B.P.	site V 4, Maglemosean (Kozlowski 1973a:340; Mellars 1974:94; *Radiocarbon* 6:122-3)
		Q-650	7720±160 B.C., 9670±160 B.P.	site V 2, Maglemosean (Kozlowski 1973a:340; Mellars 1974:95; *Radiocarbon* 6:122-3)
		Q-652	7530±160 B.C., 9480±160 or 9500±160 B.P.	site V 1, Maglemosean (Kozlowski 1973a:340; Mellars 1974:95; *Radiocarbon* 6:122-3)
3	Star Carr	C-353	7538±350 B.C., 9488±350 B.P.	Maglemosean (Mellars 1974: 95; Kozlowski 1973a:340)
		Q-14	7607±210 B.C. 9557±210 B.P.	same (Kozlowski 1973a:340;Mellars 1974:95)

Data Concerning Map 8

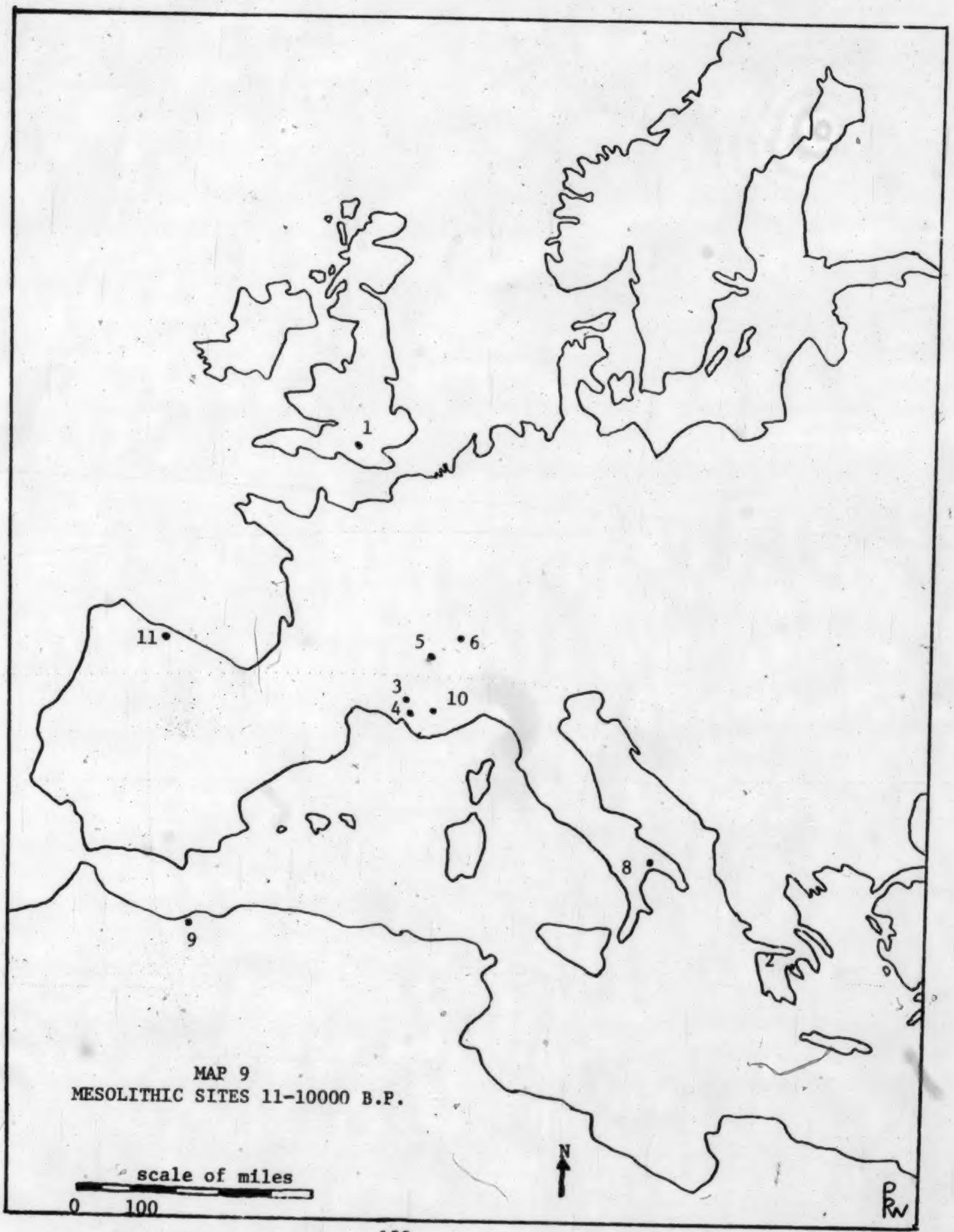
Number on map	Site	Lab Number	Date	Information and source
4	Ain Naga	not given	7250±200 B.C., 9200±200 B.P.	*Capsien supérieur* (Camps and Camps-Fabrer 1972:57)
		ALG-12	9300±300 B.P.	Upper Capsian or Neolithic (*Radiocarbon* 12 (2):355)
5	Franchthi Cave	P-1398	7148±130 B.C., 9098±130 B.P.	Mesolithic, Pit G, unit 31 (Jacobsen 1969a:375; *Radiocarbon* 13(2):365)
		P-1517	7084±108 B.C., 9034±108 B.P.	same, Pit G-1, unit 39 (Jacobsen 1969a: 375; *Radiocarbon* 13(2):366)
		P-1519	7314±144 B.C., 9264±144 B.P.	early Mesolithic, Pit G/G-1, unit 60, (Jacobsen 1969a:375; *Radiocarbon* 13(2): 366)
		P-1522	7348±130 B.C., 9298±130 B.P.	Early Mesolithic, Pit H, unit 61,B1 (Jacobsen 1969a: 375; *Radiocarbon* 13(2):367)
		P-1665	9477±134 B.P.	Mesolithic, pit H-1, unit A-117P (*Radiocarbon* 13 (2): 366)

Data Concerning Map 8

Number on map	Site	Lab Number	Date	Information and source
6	Klosterlund	P-1665	±7150 B.C., ±9100 B.P.	Danish Preboreal (Kozlowski 1973a: 340)
7	Całowanie	not given	7300±55 B.C., 9250±55 B.P.	Kormornica culture (Kozlowski 1973a:341)
8	Pulli (not shown on map)	not given	7630±120 B.C., 9580±120 B.P.	Kunda culture, Preboreal (Kozlowski 1973a: 350)
9	St. Thibaud de Couz: Abri JP-1	Ly-428	9050±260 B.P.	square i6, level 5a, Azilian (Delibrias and Evin 1974:155)
10	Levanzo Island, Cala Genovesi Cave	Pi-119	9694±110 B.P.	'coastal Mesolithic' (Radiocarbon 3:99)
11	Draved Mose	not given	range of 7100/6250 B.C., 9050/8200 B.P.	(Tauber 1972:107)
		not given	range of 7450/6850 B.C., 9400/8800 B.P.	(Tauber 1972: 107)
		K-582	9060±130 B.P.	younger Klosterlund (Radiocarbon 4:31)

Data Concerning Map 8

Number on map	Site	Lab Number	Date	Information and source
11	Draved Mose	K-791	9050±160 B.P.	Klosterlund and younger Klosterlund (Radiocarbon 8:227)
12	Romanelli Cave	GrN-2056	9880±100 B.P.	Romanellian with a cold steppe fauna (Radiocarbon 5:170)
		GrN-2154	9790±80 B.P.	same (Radiocarbon 5:170)
13	Osh Khon (not shown on map)	RUL-280	9530±130 B.P.	Mesolithic (Radiocarbon 7:226)
14	Kunda	TA-12	9780±260 B.P.	Mesolithic, date felt to be too early (Radiocarbon 8:433)
15	Hahnentage	GrN-4673	9060±50 B.P.	Mesolithic (Radiocarbon 9:122)
16	Gramari	Gif-754	9340±220 B.P.	Sauveterrian 'questionable' (Radiocarbon 13 (2):355)
17	Havelte de Doeze	GrN-6657	9145±55 B.P.	H2: feature 5, H2:I (Price et. al. 1974:58)



MAP 9
MESOLITHIC SITES 11-10000 B.P.

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Data Concerning Map 9

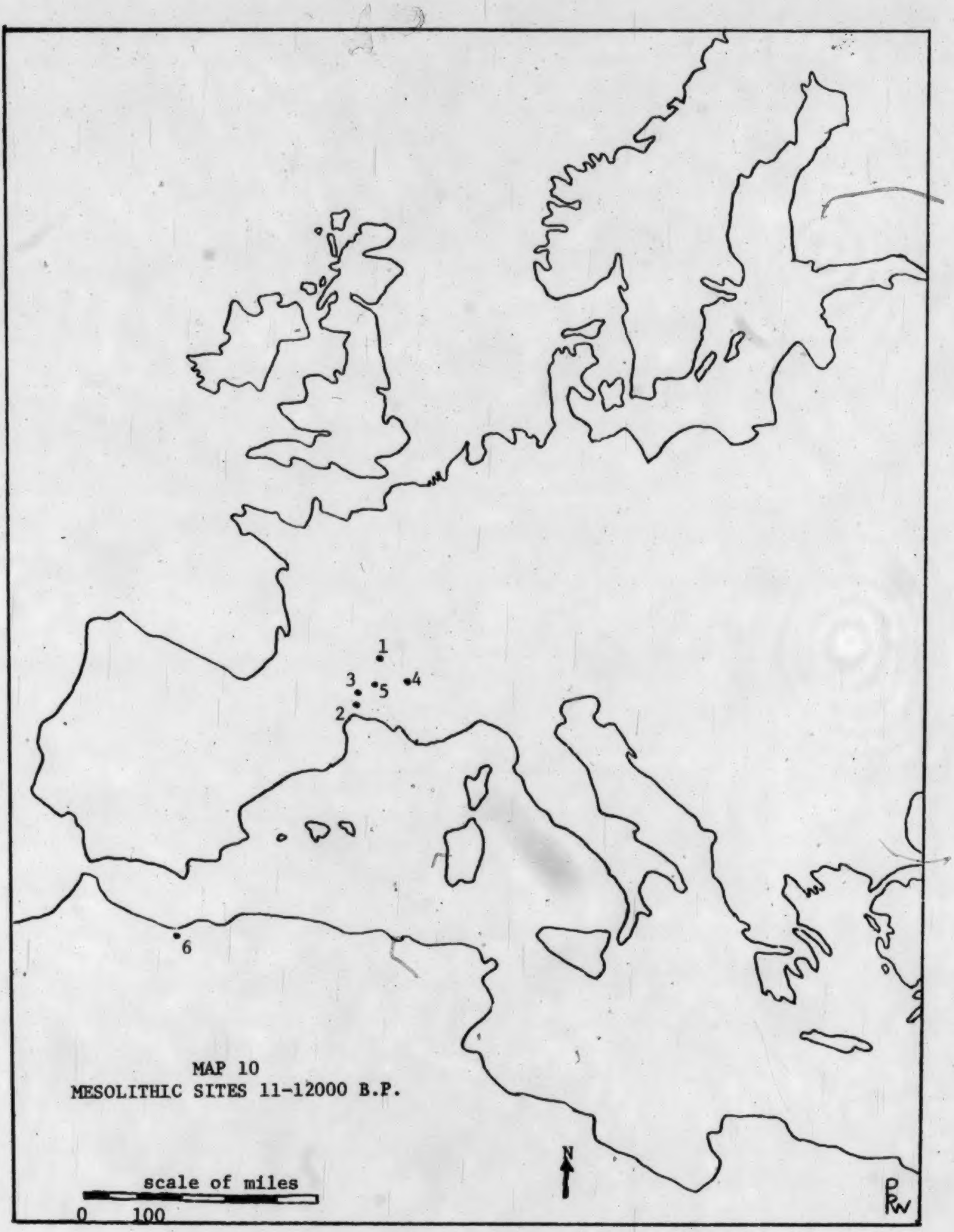
Number on map	Site	Lab Number	Date	Information and source
1	Thatcham	Q-659	8415±170 B.C., 10,035±170 B.P.	Site III 2, Maglemosean (Mellars 1974:94; *Radiocarbon* 6:123; Kozlowski 1973a:340)
		Q-658	8080±170 B.C., 10,030±170 B.P.	Site III 1, same (Mellars 1974:94; *Radiocarbon* 6:123; Kozlowski 1973a: 340)
2	Franchthi Cave	I-6139	8510±210 B.C., 10,460±210 B.P.	Mesolithic (Jacobsen 1973a:86)
3	St. Quentin de Vallorgues: La Baume	Kn-61	10,910±225 B.P.	Middle Romanellian; level 8 (Delibrias and Evin 1974:153)
		Hv-1344	10,910±225 B.P.	same; level 10 (Delibrias and Evin 1974:153)
4	Abri Corneille	Ly-414	10,270±470 B.P.	level 9a, Romanellian of the Allerød (Delibrias and Evin 1974:153)
		Ly-427	10,870±320 B.P.	level 10a, Middle Romanellian of the Allerød (Delibrias and Evin 1974:153)

Data Concerning Map 9

Number on map	Site	Lab Number	Date	Information and source
4	Abri Corneille	Ly-510	10,540±310 B.P.	Middle Allerød Romanellian, level 10c (Delibrias and Evin 1974:153)
		Ly-499	10,920±210 B.P.	older Romanellian end of Allerød, level 12 (Delibrias and Evin 1974:153), seen as too recent
5	St. Thibaud de Couz: Abri JP-1	Ly-596	10,750±300 B.P.	square hi, 6c/6b level; final Magdalenian/Azilian (Delibrias and Evin 1974:153)
		Ly-625	10,470±200 B.P.	square vw, level 2c; final Magdalenian/Azilian (Delibrias and Evin 1974:153)
6	Seebeig-Fursteiner	B-16	10,200±200 B.P.	'Epipalaeolithic' no microliths (*Radiocarbon* 1:140)
		Pi-6	10,178±400 B.P.	same (*Radiocarbon* 1:140)
7	Shanidar (see map 13)	W-667	10,600±300 B.P.	Layer B, Mesolithic to Upper Palaeolithic (Zarzian) (*Radiocarbon* 2:183)

Data Concerning Map 9

Number on map	Site	Lab Number	Date	Information and source
8	Romanelli Cave	GrN-2305	10,320±130 B.P.	Romanelli A3 (*Radiocarbon* 5:170)
		GrN-2153	10,390±80 B.P.	Romanelli C1 (*Radiocarbon* 5:170)
		GrN-2055	10,640±100 B.P.	Romanelli D (*Radiocarbon* 5:170)
9	Taforalt	Sa-13	10,800±400 B.P.	advanced epi-palaeolithic, level II (*Radiocarbon* 6:243)
		Sa-15	10,500±400 B.P.	oldest epi-palaeolithic level VIII (*Radiocarbon* 6:243)
10	Gramari	Gif-755	10,070±230 B.P.	Sauveterrian 'questionable' (*Radiocarbon* 13 (2):219.
11	El Cierro	Gak-2548	10,712±515 B.P.	Azilian (Clark 1971:1255)



MAP 10
MESOLITHIC SITES 11-12000 B.P.

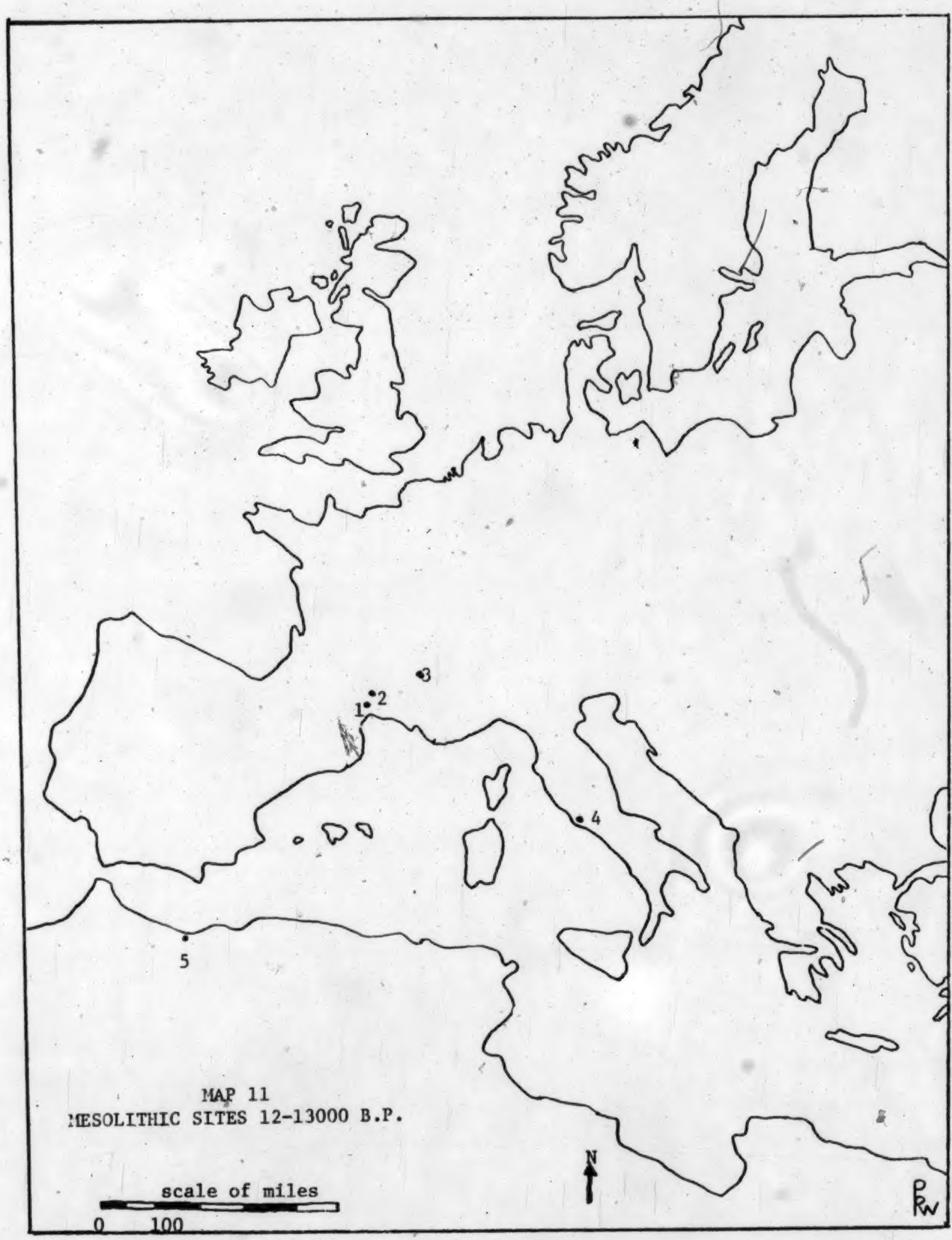
1
2
3
4
5
6
scale of miles
0
100
N
PRW

Data Concerning Map 10

Number on map	Site	Lab Number	Date	Information and source
1	La Colombière	Ly-725	11,660±240 B.P.	Azilian of the Allerød with painted pebbles but reindeer most important faunal element (Desbrosse and Giraud 1974: 488-490)
2	St. Quentin de Vallorgues: La Baume	Hv-1345	11,270±230 B.P.	Middle Romanellian (Delibrias and Evin 1974:153)
		Kn-68	11,200±115 B.P.	same (Delibrias and Evin 1974:153)
3	St. Remeze Le Saut du Loup	Ly-318	11,750±301 B.P.	level D, "old Azilian" (Delibrias and Evin 1974:154)
		Ly-320	11,500±380 B.P.	"Old Azilian" (Delibrias and Evin 1974:154)
4	St.Nazaire en Royan	Ly-336	11,409±250 B.P.	Epipalaeolithic (Delibrias and Evin 1974:154)
5	St. Thibaud de Couz-Abri JP-1	Ly-429	11,900±360 B.P.	Final Magdalenian/ Azilian; square i6, level 7 (Delibrias and Evin 1974:155)

Data Concerning Map 10

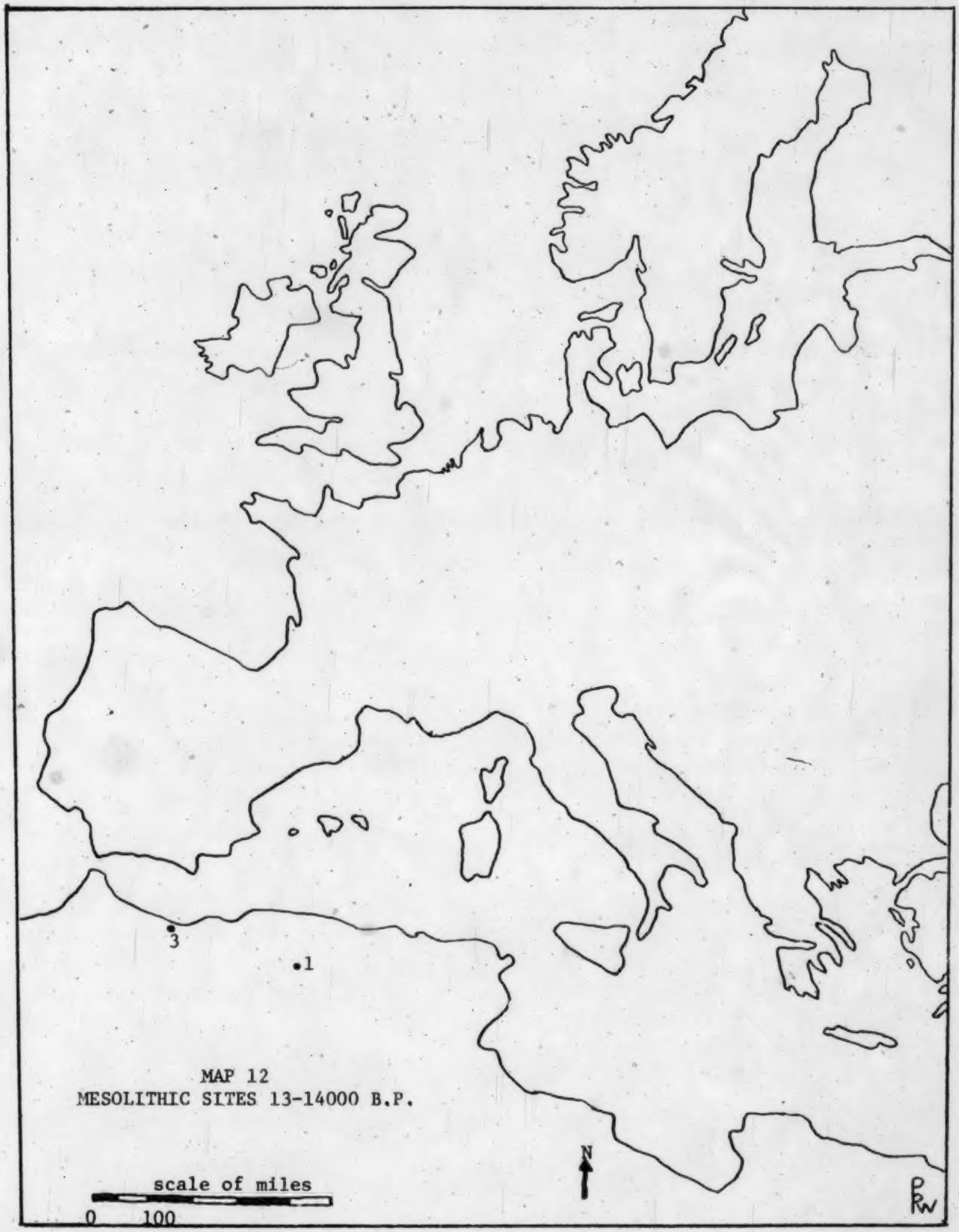
Number on map	Site	Lab Number	Date	Information and source
6	Taforalt	L-399E	11,900±240 B.P.	Oranian (*Radiocarbon* 1:25)
7	Tell es Sultan, Jordan (see map 13)	P-376	11,166±107 B.P.	"Mesolithic" (*Radiocarbon* 5:84)


1
2
3
4
5
scale of miles
0
100
N
PRW

MAP 11
MESOLITHIC SITES 12-13000 B.P.

Data Concerning Map 11

Number on map	Site	Lab Number	Date	Information and source
1	St. Quentin de Vallorgues: La Baume	Hv-1346	12,060±250 B.P.	'middle Romanellian' (Delibrias and Evin 1974: 153)
2	St. Remeze Le Saut du Loup	Ly-319	12,080±310 B.P.	level D, 'old Azilian' (Delibrias and Evin 1974:153)
3	St. Nazaire en Royan	Ly-436	12,800±300 B.P.	"Magdalénien à caractere azilien" (Delibrias and Evin 1974:154)
4	Grotta di Ortucchio	Pi-23	12,619±410 B.P.	early Mesolithic (Radiocarbon 1:106)
5	Taforalt	L-399G	12,100±100 B.P.	Oranian level C (Radiocarbon 3: 172)
		Sa-14	12,070±400 B.P.	Middle Epipalaeolithic level VI (Radiocarbon 6: 243)

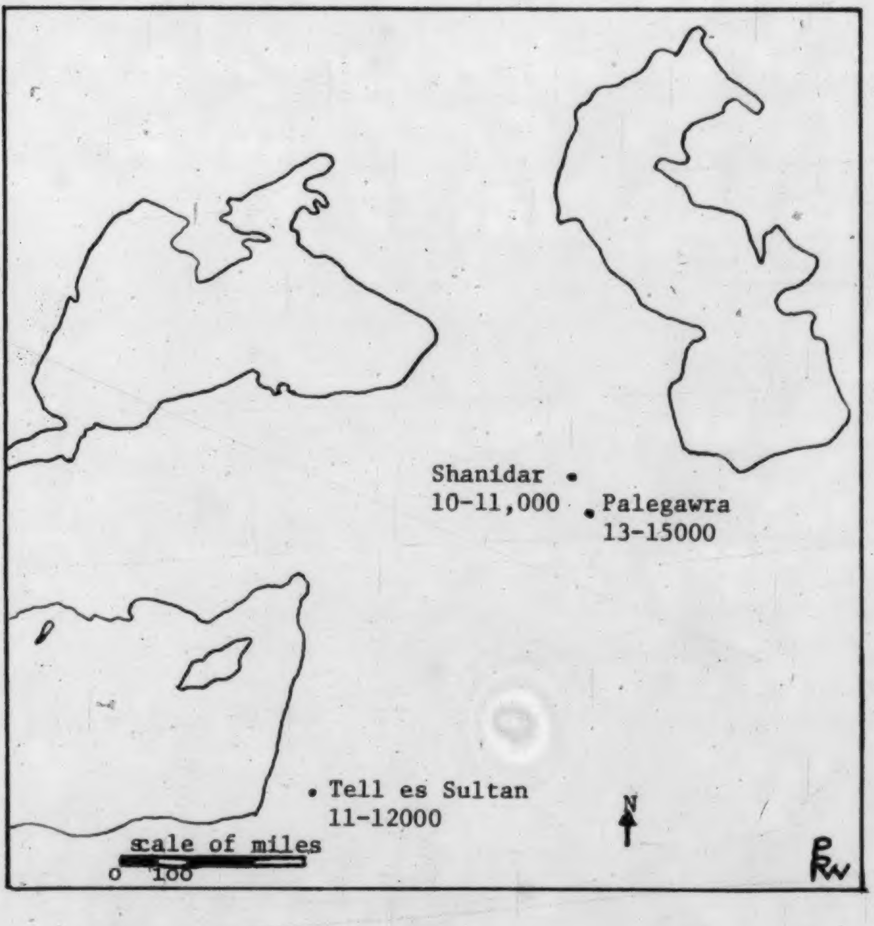


MAP 12
MESOLITHIC SITES 13-14000 B.P.

3
1
N
scale of miles
0
100
PRW

Data Concerning Map 12

Number on map	Site	Lab Number	Date	Information and source
1	Rassel	not given	12,300±400 B.C., 13,270±400 B.P.	oldest Epipalaeolithic date (Iberomaurusian)(Camps and Camps-Fabrer 1972:57; Radiocarbon 12(2):354)
2	Palegawra (see map 13)	UCLA-1714D	13,350±460 B.P.	Zarzian at 80-100 cm. (Turnbull and Reed 1974:84)
3	Taforalt	L-399G	13,000±250 B.P.	level C, Oranian (Radiocarbon 3: 172)
		L-399G	13,900±250 B.P.	same (Radiocarbon 3:172)


Shanidar
10-11,000
Palegawra
13-15000
Tell es Sultan
11-12000
scale of miles
0 100
N
RW

MAP 13
MESOLITHIC SITES IN THE NEAR EAST (B.P.)

Data Concerning Map 13

Number on map	Site	Lab Number	Date	Information and source
no number given	Palegawra	not given	14,460±760 B.P.	Zarzian at Palegawra 120 cm. (Turnbull and Reed 1974:84)

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